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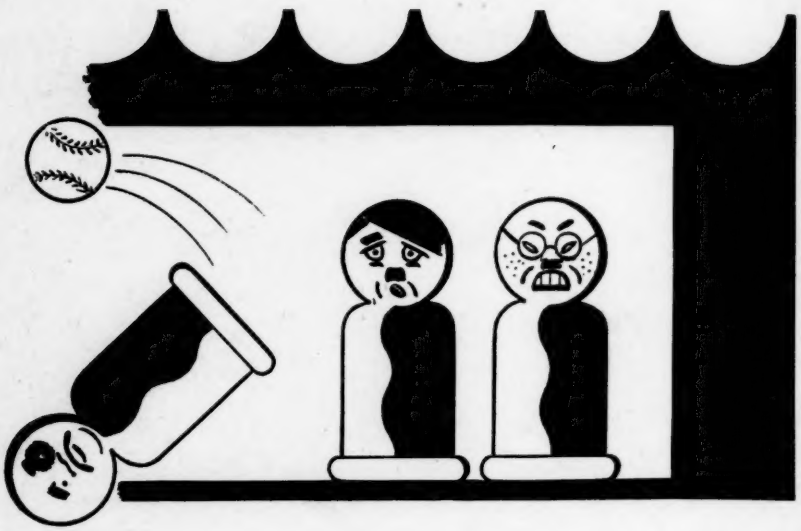

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 26 OCTOBER, 1943 NUMBER 10

THE STORY OF THE RED CROSS INSTITUTE FOR THE BLIND (1918-1925) IN RELATION TO THE PRESENT PROBLEM OF THE WAR BLINDED*

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The Red Cross Institute for the Blind, organized first as General Hospital No. 7, but generally known as the Evergreen School for the Blind, was the agency established during the World War I for the training and rehabilitation of members of the armed forces who became blind. The problem of the training and rehabilitation of similar cases occurring in the armed forces is now becoming a pressing one. It is pertinent, therefore, that former experiences in this field be reviewed as the new program for the training of the blind is formulated. Various phases of the history of the Evergreen School have already been reported.[1-7] From these various publications, a diary kept by Dr. James Bordley, and from personal experience, the following epitome of the history of this institution is drawn.

Shortly after the outbreak of hostilities in 1917, the National Defense Council appointed a Subcommittee of Ophthalmology. Subsequently, many members of the Committee became attached to the Surgeon General's Office in one capacity or another. While still a member of this Committee, Dr. James Bordley of Baltimore became interested in reconstruction plans of other warring nations, especially as concerned the blind. His conclusion was that a program for the rehabilitation of the blind would best be undertaken by such an outside agency as the American Red Cross. A tentative plan to this end was submitted to the American Red Cross with the result that Mr. Henry Davison, the Director General of the American Red Cross, laid the subject before the Surgeon General with an offer from the American Red Cross to finance the project. This offer was declined on the ground "that the Secretary of War was not inclined to accept financial aid from civilian agencies." The program for the training and rehabilitation of the blind then became a charge of the Surgeon General's Office.

In the summer of 1917, the late Mrs. T. Harrison Garrett, on the suggestion of Dr. Bordley, offered her estate in the suburbs of Baltimore as a site for the establishment of a school for the re-education of blind soldiers. This was inspected by "a sub-committee of blind educators," and a report recommending the acceptance of this offer was duly made to the Surgeon General. It was endorsed by him and later by the Secretary of War, and this lot of ground, 99 acres with several buildings, was taken over on November 17, 1917, by the Government at a rental of one dollar per annum. Plans for the remodeling of the existing buildings and construction of new buildings were then drawn. There was, however, some delay in the appro-

*From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital.

priation of the necessary funds, and it was not until April, 1919, that the actual new reconstruction was begun. The first patients were received in April, 1919, and housed in the buildings then available. By the fall of 1919, construction was substantially completed, equipment was installed, and the instruction was begun, the school being known as General Hospital No. 7, under the Surgeon General's Office. At no time in its existence, however, should the Evergreen School be considered as a hospital. Blind soldiers, returning from overseas, and still in need of medical attention, were referred to a general hospital at Cape May, New Jersey, where special equipment and personnel had been provided for the care of eye patients. There the blind soldiers were kept until it was felt that further hospital care was no longer needed, at which time they were transferred to General Hospital No. 7. From this source, other hospitals, and later other vocational training schools, the students at Evergreen School were derived. Such medical care as was needed by these blind students was provided at first by the Army Medical Corps.

The Evergreen School remained as General Hospital No. 7, under the Medical Department of the United States Army, until May 25, 1919. At that time it was believed that blinded patients would be benefited by a termination of their military status. There were also certain obvious advantages in having the institution under the control of a private agency, a more elastic expenditure of funds being feasible. Accordingly, early in 1919, the Surgeon General recommended to the War Department that blind soldiers requiring no further treatment be discharged from the Army, that those requiring further treatment be transferred to General Hospital No. 2 at Fort McHenry, Maryland, and when such treatment was completed, they also be discharged. All such discharged blind soldiers were to be turned over to the Federal Board of Vocational Education and the War Risk Insurance Bureau. Military supervision should extend only to the maintenance of order and discipline and the preservation of property. These recommendations having been approved, and the offer of the American Red Cross having been renewed, on May 25, 1919, all buildings and equipment were turned over to the American Red Cross on a revocable lease, so that organization, in coöperation with the Federal Board of Vocational Training, could carry on the instruction of the blind. The institution now became known as the Red Cross Institute for the Blind. Dr. James Bordley, then Lieutenant Colonel, was appointed Director, being allowed by the Surgeon General to combine this duty with his assignment in the rehabilitation section of the Surgeon General's Office. Such medical attention as was required by the students was provided by various consulting ophthalmologists, and by special consultants employed by the Public Health Service.

Under the Red Cross, the Evergreen School reached its fullest development and maximum usefulness. A fund of approximately four and a half million dollars was raised by public subscription for the development and maintenance of the Institute. The full capacity of the Institute was 150. Prior to December, 1918, the maximum number of patients was below 50. Thereafter it increased, and, after being taken over by the Red Cross, the number of students remained between 100 and 150.

There was no fixed period of instruction. The usual course of instruction consisted of a preparatory course, consisting of Braille, English, typewriting, and handwriting. Thereafter the student en-

tered one or another of the vocational courses until it was determined for which one he was best individually equipped. In the selected field he received instruction until it was felt he was prepared for civilian life, either at home, in the blind shops, in industry, or agriculture, or was prepared to enter some university or professional school for special training. The vocational courses consisted of agriculture, including poultry raising and dairy farming; commerce, including store-keeping; industry, including auto-shop repairing; vulcanizing; cigar manufacturing; novelty work; weaving; woodworking; and tire repairing. "Avocational" courses in life insurance, bookbinding, basket making, and weaving were given. Abundant recreational facilities were available —music, dances, public speaking, and the like—in addition to bowling alleys and a swimming pool.

Especially interesting was a model store established at the school, where all details of purchasing, salesmanship, and store management were taught to the blind soldiers. A second store known as the "Evergreen Victory Stores" was established at Perryville, Maryland, and later a number of similar chain stores were established by the blind men themselves in various localities, all controlled and financed by the Red Cross Institute for the Blind. In general it was the policy of the school to afford the students the widest possible latitude, so that the blind student might obtain the kind of training he desired, provided it was advisable and practical. The professional and teaching staffs were in the main recruited from the staffs of various blind schools throughout the country, with special volunteer instructors in special fields from time to time. A reception home was established in Baltimore for the families and relatives of the blind students. When a student was transferred to Evergreen, an effort was made by the Red Cross to have his parent or close relative come to Baltimore to meet him, see him installed in the Institute, and be with him during the first days of readjustment. All expenses, including traveling expenses, were borne by the Red Cross.

The Evergreen School continued under the administration of the Red Cross from May 25, 1919, to January 1, 1922. On August 9, 1921, the Veterans' Bureau was established. Up to this time the medical and hospital service for discharged veterans had been administered by the Public Health Service, and the rehabilitation program by the Federal Board for Vocational Education. The duties of these organizations had grown to the point where the divisions handling veterans' relief had expanded until they greatly overshadowed their parent organizations. The Veterans' Bureau was organized to relieve the Public Health Service and the Federal Board of these duties, and to combine them under one organization. In line with this program, there was no place for the Red Cross in the picture, and accordingly, on January 1, 1922, the Red Cross Institute for the Blind was turned over "in toto" to the Veterans' Bureau, under whose charge it remained, with gradually waning and diminishing usefulness and activity until its final demise and closure in June of 1925.

My personal association with the Evergreen School began early in March of 1920, at which time I was appointed consulting ophthalmologist, a post which I continued to hold, under various auspices, until the final closing of the school in 1925. During this period I personally examined every student already in the school or thereafter admitted. My experience therefore covers the last two years of the Red Cross administration, and the final three years under the Veterans' Bureau. During this period, in addition to

the regular service and Veterans' Bureau records, I kept a personal file of all histories and examinations.

In this personal file are 325 case records, which represent the total number of men trained at Evergreen from March 23, 1920, when I held my first clinic, up to the final close of the school in June of 1925. The actual number of men who received blind training at Evergreen during its entire life (as General Hospital No. 7, the Red Cross Institute for the Blind, and under the Veterans' Bureau) would be these 325 men plus men discharged prior to March of 1920. I have been unable to obtain an accurate record of the number of men who finished training and were discharged prior to March of 1920. However, there is a report of the individual soldiers admitted to Evergreen up to May 25, 1919, when it functioned as General Hospital No. 7. One hundred and seventeen soldiers were admitted to Evergreen up to that date. A comparison of my file against this record reveals 60 of these 117 soldiers were still at Evergreen in March of 1920, 57 having been discharged. The number of men admitted after May 25, 1919, who completed their education and were discharged prior to March of 1920, must have been very small. It seems therefore a conservative estimate that 75 would represent the total number of discharges prior to March of 1920, and that the total number of soldiers and students that passed through Evergreen during its entire life under its various auspices was in the neighborhood of 400.

A review of the 325 case histories shows that, on the basis of ocular pathology, they may be divided into the following groups, with the indicated number of men in each group: cases of trauma, 106; of optic-nerve disease, 66; of hysterical amblyopia, 27; of atrophic choroiditis, 17; of retinitis pigmentosa, 14; of amblyopia due to systemic disease, 12; of errors of refraction, 14; of war-gas injuries, 12; of cataracts, 12; of uveitis with secondary cataracts, 8; of superficial keratitis, 9; of interstitial keratitis, 8; of trachoma, 5; of amblyopia due to cortical injury, 4; of detachment of the retina, 4; of glaucoma, 3; of superficial retinitis, 2; of keratoconus and nystagmus, 1 each.

I. Cases of trauma. There were 106 soldiers in this group. Seventy-eight of these men had suffered war wounds and were therefore blinded as a result of enemy action. In the remaining 28 the ocular trauma had not been inflicted by enemy action, but was the result of various accidents which occurred chiefly in training camps in this country and abroad.

As has already been stated, an indeterminate number of soldiers, probably in the neighborhood of 75, had been discharged from Evergreen before my association with the school began, and there are no records available on some of these men. In the majority of cases the disability was due to trauma, mainly to battle injuries, for these were the first students sent to Evergreen. It seems, therefore, a fair assumption that the total number of soldiers blinded by enemy action who were later trained at Evergreen was in the neighborhood of 150.

The general types of wounds in this group were what might be expected following injuries from high explosives, shrapnel, gunshot, machine guns, bombs, and hand grenades. There were 16 cases of bilateral anophthalmos and 25 cases of unilateral anophthalmos, the second eye being blind from phthisis bulbi, traumatic cataract, detached retina, proliferating changes, and so forth. There were four cases of bilateral phthisis bulbi. There were 10 cases in which there had not been penetrating wounds of the eyes, but in which the soldiers, as a result of explosion or remote injuries, had suf-

fered bilateral concussion changes in the fundus, with the final picture of choroidal scars and atrophic choroiditis. There were four cases of cortical blindness, following occipital-lobe injuries. The remaining cases of blindness due to enemy action were an assortment of penetrating wounds, detached retinas, traumatic cataracts, and proliferating changes.

The 28 cases in which the ocular trauma did not result from enemy action were due usually to injuries sustained in training camps—the accidental explosion of percussion caps or hand grenades, blows on the eye or head, falls, and such accidents as might occur in civilian life. The six cases of blindness due to burns were the result of acid burns, most of which were sustained in civilian occupations after discharge from the Service.

II. Optic-nerve disease. The 66 cases of optic-nerve disease were distributed as follows: primary syphilitic atrophy, 22; primary atrophy of the nerve, cause undetermined, 17; secondary, post-neuritic atrophy, cause undetermined, 4; papillo-macular-bundle atrophy, suspected or proved multiple sclerosis, 13; toxic amblyopia (wood-alcohol poisoning), 6; atrophy secondary to sinus disease, 2; atrophy secondary to brain tumor, 2. There was nothing remarkable in this group. The large number (17 cases) of primary atrophy of undetermined cause is probably a reflection of inadequate study of the patients, while the six patients blinded by wood alcohol is a sad reminder that the Evergreen School flourished in the late unlamented prohibition era.

III. Hysterical amblyopia. The hysterical amblyopia group, 27 in number, was of considerable interest. Twelve of these patients confessed to vision of 2/60 or better, while 12 others had either no light perception or at best could detect hand movements. The three remaining individuals were believed to be straight malingerers. The entire group presented much the same sorry spectacle—nervous, psychoneurotic individuals with every imaginable complaint. Their diagnosis and condition were known to the other students who, almost without exception, regarded them as "fakes." They were more or less objects of general scorn. Poor students, they remained in the school year after year, shifting from one department to another, and the majority of them became hopelessly institutionalized. When the school was finally closed, they were distributed to various psychopathic hospitals, where they would probably have been better off from the beginning. They presented much the same ophthalmologic picture, with tremor of the closed lids, and often only partial voluntary control of the extraocular movements. Blepharospasm was common. Those who still retained some vision uniformly had visual fields contracted usually to about the 10-degree meridian. None showed any ocular pathology on objective examination.

There was a small but very interesting subgroup of cases of unilateral hysterical amblyopia, which are not included in the main group. There were six men in this category, all of whom showed the common picture of having lost one eye, usually either from wounds or disease, with the second eye objectively entirely normal. As the time approached for their discharge from the hospital where they had been treated for the ocular injury or disease, they began to develop failing vision in the second eye without any demonstrable pathologic basis. In three patients the final vision in the otherwise normal eye was from 20/100 to 20/200, in two it was in the neighborhood of 20/40. All six of these individuals had the usual pictures of tremor of the lids, constricted fields, and so forth. In one

individual, whose one eye had been lost from a mustard-gas injury, the vision in the second eye declined to the ability to see hand movements. Three of these six men had lost the first eye from wounds or explosives, two from mustard gas, and the last from an extensive choroiditis. They are especially interesting in that their hysteria manifested itself in their own original disability-blindness.

IV. Atrophic choroiditis. The 17 men in this group were not unusual. Sixteen had extensive bilateral atrophic choroiditis, while in one the disease was still active. Several of these men were carefully studied, while others refused any further medical attention. Two were known syphilitics, three had extensive foci of infection, two were obviously tubercular. In the remaining cases medical surveys were either negative, inadequate, or were totally lacking. In all 17 vision was so reduced, or the visual fields so damaged, that they were indubitably blind.

V. Retinitis pigmentosa. The 14 members of this group showed nothing noteworthy except their comparative youth, the average age of these patients being 28 years. In every individual the symptoms of the disease first became apparent while he was in the service. This brings up the interesting point of whether the physical stress of military service may be a predisposing factor in the early outbreak of this disease in individuals who have an hereditary tendency. Three of these patients still had central vision of 20/40 or better, but their constricted fields, annular scotomata, night blindness, and hopeless prognosis made them proper candidates for a blind school.

VI. Amblyopia from systemic disease. The various conditions listed under this heading were three cases of bilateral endophthalmitis following cerebrospinal meningitis, three cases of bilateral endophthalmitis following influenza-pneumonia, three cases of postneuritic optic atrophy following meningitis, two similar cases following influenza, and one case of embolus of one central retinal artery, the second eye being normal. This patient's condition was similar to that of several men who were sent to Evergreen under the Veterans' Bureau Administration.

VII. Errors of refraction. There were 14 men whose only ocular pathology was a high refractive error, although in 3 cases the myopia was complicated by choroidal changes. Five of these individuals had a minimum of 20/30 corrected vision in each eye. One had 20/40 and 20/100 corrected, three had high myopia with myopic choroiditis and vision of 20/200 or less in the better eye, while four had high hyperopia, with 10° diopters of hyperopic astigmatism, and vision of 20/200 or less. One man was believed to be a straight malingerer. Some of these individuals were admitted to Evergreen under the Red Cross Administration, having been sent by the Federal Bureau, and two were admitted under the Veterans' Administration. They appeared, with various other companions, to represent a lot of ne'er-do-wells who had tried one type of vocational training after another in various centers, had been chronic failures at everything they attempted, who consistently blamed their failure on their eyes, and who finally had been shipped to a blind school in sheer desperation to get rid of them. In the main, these men were a group of chronic trouble-makers.

VIII. War-gas injuries. The 12 gas injuries could be divided as follows: 8 cases of recurrent keratoconjunctivitis following mustard gas, incurred as a result of

enemy action; 4 cases of uveal-tract disease following liquid-mustard burns, 2 eyes having been enucleated. The symptomatology in these cases has been commented upon elsewhere.[8] As already noted, two of these patients with unlateral eye injuries only developed a hysterical amblyopia in the second eye.

IX. Cataracts. The 12 patients with cataracts represented an interesting group. The average age of this group was 30.6 years. Five patients had straight posterior cortical cataracts without any other evidence of ocular pathology, with vision of 20/100 in the better eye. Operation had been advised, and apparently refused, the patients preferring to remain partially blind and to draw pensions. One patient had congenital posterior polar cataracts with 20/40 vision in each eye, while three patients had been operated upon with poor results, two on one eye only and one on both eyes. The two patients who had had unilateral operations preferred to keep the small amount of vision remaining in the second eye rather than risk another operation. Another patient with bilateral cataracts had had one successful operation, with 20/20 corrected vision resulting. Even though he had only light perception in the eye that had not been operated on, he refused to wear his correcting lens before the operated eye that had undergone surgery. Since there was no way of compelling the discharged soldier to do so, he was sent to a blind school! The last patient was unusual in that he had dotlike opacities in the anterior cortex, the picture of metabolic cataracts for which no cause has been found. He had 20/20— vision in one eye and 20/30 in the second.

X. Uveitis. There were eight cases of old uveitis with blindness resulting from the usual complications—secondary cataract, secondary glaucoma, occlusio pupillae, and so forth. None of these had been sufficiently studied to make even a reasonable guess as to the etiology of the ocular disease. All of these patients were blind, the maximum vision being, for example, as in one man who had 20/200 vision in one eye and no light perception in the second eye. There was nothing especially noteworthy in the entire group.

XI. Keratitis. There were nine patients in whom the blindness was due to superficial scarring of the cornea from an old ulcerative keratitis. All except one of the patients had vision below 20/200 in the better eye. One patient had 20/100 in one eye and 20/60 in the second, but the social and mental status of this patient was such that the visual defect constituted a major handicap and his blind education was quite justifiable.

There were eight patients with syphilitic interstitial keratitis. One of them was unusual in that it was undoubtedly a complication of acquired syphilis, the first onset of the keratitis coming on 10 months after the initial lesion. One of those whose syphilis was congenital deserves special mention. He was 35 years of age, a quaint character, who had all the possible stigmata of congenital syphilis, had had repeated attacks of keratitis since childhood, had no light perception in one eye, and only 20/200 in the second eye. His chief delight in life was telling any audience he could corner the story of his life-long battle against "them lues." Just how he was ever admitted to the Army, and so became a life-long pensioner of the Government, has always been a mystery. The other six men who had congenital syphilis were all industrially blind, and were not noteworthy.

XII. Trachoma. In all the five cases of trachoma there was marked corneal involvement and each of the men was industrially blind. Two were old cases

of patients who had had the disease prior to their entrance into the Army. Three had apparently acquired the disease in the service. There was nothing remarkable in any of the patients.

XIII. Detachment of the retina. There were four cases of detachment of the retina. One of these was bilateral, of undetermined cause. Three were unilateral —in one case the second eye was amblyopic, in the second case the other eye was the site of an extensive choroiditis, while in the third case the second eye was entirely normal, with a full 20/20 vision. By what misguided agency this last patient was sent to a blind school, there is no record.

XIV. Glaucoma. There were only three patients with uncomplicated glaucoma in the Evergreen School. One of these was totally blind from an advanced glaucoma not brought to operation; the second had had bilateral iridectomies performed without effect, and at the time of examination had 20/50 vision in one eye and only light perception in the other. The last patient had a typical glaucoma, for which there had been no operation, with 20/50 vision in one eye and 20/70 in the other. The glaucoma was uncontrolled by miotics, and the patient, refusing operation, was duly sent to a blind school, which was perhaps as good a place as any for him.

XV. Retinitis. There were two patients under this diagnosis. One was blind from bilateral holes in the macula, while the second had a superficial retinitis which developed after exposure of the eyes to extreme infra-red rays. This patient had 20/50 vision in one eye, and could detect hand movements only in the other eye.

XVI. Keratoconus. The one patient with keratoconus was a woman, the only female among the students. There is no record available of her vocation or why she was admitted to Evergreen. The vision was approximately 20/200 in each eye.

XVII. Nystagmus. There was only one student on whom this was the primary diagnosis. The right eye of this man was amblyopic, and had been badly damaged by an earlier operation designed to correct a strabismus. The second, presumably normal, eye developed a nystagmus of undetermined etiology, which reduced the vision to 20/50. In this state the patient was admitted to Evergreen.

Comment

A survey of the history of the Evergreen School and the men admitted there as students brings up certain pertinent questions as concerns the men blinded in the present war. *First.* How many blind men may be expected from the Armed Forces during the present war? *Second.* Should an agency somewhat similar to the Evergreen School be established as a training school and rehabilitation center for such blind men? *Third.* What should be the criteria for admission to such a rehabilitation center, and who should be the judges of these criteria? *Fourth.* Are men blind from hysterical amblyopia proper individuals for training in a blind school in association with the mentally stable blinded? *Fifth.* Under what agency and direction should such a school be established?

In the light of our experiences at Evergreen these questions may be briefly commented upon.

First. The total population at Evergreen during its entire existence was probably about 400. There were, however, a number of men blinded in the last war, either by enemy action, accident, or dis-

ease, who were not educated at Evergreen. I have found no accurate figures of this total. In one report of the Veterans' Bureau,[9] it is stated that 260 blind men had been or were being educated at Evergreen and 130 blind men in other institutions. With the exception of a center in District No. 9, where apparently the chief subject taught was poultry farming, with side lines of basketry and rug weaving, it is not stated where or what these other institutions were, or whether the blind men sent there had been former students at Evergreen. It is quite probable that blind men educated in other institutions might in many instances have been former inmates of Evergreen, who following various vicissitudes after discharge, had wound up in other Veterans' Bureau facilities. In this same report (page 429), mention is made of the colored blind, but no figures are given. It is probable that the total number of service men who received special training after the last war on account of visual defects was in the general neighborhood of 500, of whom about one half were war casualties. This was for a total of approximately 4,000,000 men over a period of approximately two years. If we estimate the duration of this war as three years plus, and the total of the Armed Forces at roughly a maximum of 10,000,000 men under similar conditions, we might expect a total of roughly 2,000 men who will require education for the blind. However, conditions are not entirely similar. Large numbers of men have not been continuously engaged in trench warfare, there has as yet been no gas warfare, and the better organization of the medical department and the use of sulfa drugs may appreciably lessen the incidence of blindness from wounds. The differences between modern mechanized warfare and trench warfare may well tend to lessen the incidence of blindness from wounds. Further, there are as yet few casualty figures available from this war on which any adequate estimate of incidence of blindness can be based. Any estimate of the number of blind casualties is therefore little more than a guess.

As concerns blindness resulting from disease, the conditions are more comparable. It is possible that the employment of routine Wassermann tests before induction may lessen the incidence of blindness due to syphilis and late optic-nerve atrophy. The use of sulfa drugs may materially lessen the incidence of blindness from meningitis, and other infections. Except for these instances the conditions existing in 1918, as concerns blindness due to disease, do not appear materially different from those of today, and it seems a fair estimate that some 500 men blind from local or systemic disease must be expected in the present enlarged armed forces. Summing this up, it seems probable that if the war continues, and land fighting becomes widespread, there will, in all likelihood, be at least 1,000 blind whose special training and rehabilitation will become pressing problems. The figure may be much higher.

Second. If this number of blind, or any number approaching it must be given special training, it is obvious that an institution, somewhat similar to Evergreen, must be established in the immediate future. The civilian blind schools in this country are totally unable to cope with a problem of this magnitude, and there is no provision in the present Veterans' Bureau or any other Federal or public agency for such special training for such a group. The attempt to farm such blind men out to civilian institutions or various Veterans' Bureau facilities would result in an unevenness of training and care to the extent that it would become a national

scandal. This is especially true since there is no class of casualty so calculated to appeal to public sympathy as is that of the war blinded. It would seem that the answer to the question of whether a special institution to train the War Blind should be established, must be an unequivocal "Yes."

Third. The first point in relation to the student personnel is under what conditions men should be admitted to such a blind-training school. The present admirable program of the Office of the Surgeon General of the Army provides that all men who become blind in the various theatres of operation should be sent to Valley Forge General Hospital in the East and to the Letterman General Hospital in the West. There the psychiatric readjustment and blind training will begin as soon as the soldier is admitted to these centers, and will continue until his discharge. He will be discharged from these hospitals only when he has reached his maximum therapeutic and physical rehabilitation. Serious cases of ocular accident and disease are to be sent to certain designated hospitals, especially equipped for eye work, where the patient will remain until he no longer needs special hospital care. On release from these eye centers, the blind soldiers will be discharged from the Army and ready to enter a blind school.

This program contains at least one essential criterion for the admittance of students to a blind school; namely, that they shall have reached their maximum therapeutic and physical rehabilitation before entering upon vocational studies. The school should be a school, and not a hospital. Of necessity an ophthalmologist must be in constant attendance to care for the endless minor and the occasional unexpected major ocular complications which will develop in a blind population. A small eye clinic, and hospital facilities for the occasional serious unexpected complication must therefore be available, but this should be incidental, and no student should be admitted who still requires active hospital care.

The second criterion relates to the visual status of the students. Obviously, all soldiers (with the possible exception of those hysterically amblyopic) who come under the definition of blindness adopted by the Subcommittee of Ophthalmology of the National Research Council should be eligible for blind education. This definition of blindness is that the maximum of vision in the better eye be not greater than 20/200, or, if greater, that the visual field be not greater than 20 degrees in its maximum diameter. There is, however, the problem of the visually handicapped whose vision is greater than that specified in this definition. In May of 1921, the Federal Board placed at Evergreen "men with more than 1/10 vision if the degree of defectiveness prevented them from successfully pursuing the courses in which they had previously been placed elsewhere. After a tryout the Director approved the plan as a 'sight-saving' class."[10] A review of the 325 case records available from the Evergreen School shows that 43 students were not blind under the aforementioned definition of blindness, and were potential members of this "sight-saving class." Certain of these individuals were undoubtedly proper candidates for a blind education. Such were eight men who had completely lost one eye through battle wounds, with injuries to the second eye reducing the vision to 20/100. Two were men with extensive choroiditis, with 20/50 maximum vision in one eye. Very many had irregular fields and scotomata, and several had cases of pigmentary degeneration, young men whose vision was still greater than specified in the definition of

blindness but in whom the rapid progress of the disease indicated a hopeless prognosis. As to the remaining cases in this group, there was certainly no obvious reason, even under the "sight-saving" excuse for the blind education of these men. While some latitude should be allowed for men not blind under the rigid definition given above, the proper machinery should be provided to exclude men who, although visually handicapped, still have usable vision. After the last war there was certainly an undoubted tendency on the part of other rehabilitation centers to get rid of their poor material, patients who blamed their failures on visual handicaps, by shipping them off to a blind school. There they showed no ardent desire to absorb a blind education, were constant trouble-makers, and seriously interfered with the morale and discipline of the school, and in the main reflected discredit on the institution. It seems a reasonable suggestion that if any institution for the training and rehabilitation of the war blinded be again established the authorities of such an institution should have the absolute power to accept or reject men sent there for vocational training. Men who qualify under the rigid definition of blindness as hereinbefore quoted should be admitted without question. All others recommended for admission should be passed on by a committee made up from the institution's administrative personnel, consisting of an ophthalmologist, a worker trained in educating the blind, and an administrative officer. This committee should have the power not only to admit but also to dismiss unsuitable students from the school and refer them back to the Veterans' Bureau for other disposition.

Fourth. The soldiers with bilateral hysterical amblyopia present an especial problem. Certainly our experience with this group at the Evergreen School was unfortunate. Once admitted to the School, and rated as blind, they received a pension, and thereupon their blindness became firmly fastened to them for life. By and large, they were miserable students, scorned by their fellows who had lost their vision by disease. As a group they became hopelessly institutionalized, and at the close of the School in 1925, many were still there, to be disposed of to psychopathic or other Veterans' Bureau institutions. Like the men with too much vision, they tended to be trouble-makers and to interfere with the work of the institution.

The disposition of those with bilateral hysterical amblyopia presents a special problem for the psychiatrist. Certainly the solution does not appear to be to pension them as blind, and to undertake their education and rehabilitation on this basis.

Fifth. Under what agency should this proposed blind school be established? The history of the Evergreen School is interesting on this point, in that it was at various times under the direction of three different agencies—the War Department, the Red Cross, and the Veterans' Bureau. Conceived and built under the direction of the Surgeon General's Office, it soon became evident that far greater flexibility was needed for its successful operation than was possible under the existing tables of organization, and there can be little question that the decision to turn the School over to the Red Cross was a wise one. While the direction of a blind school by the War Department with students still on a military status solved the difficult problem of discipline, in all fairness it must be admitted that the education and rehabilitation of the blind is scarcely the function of a Department whose fundamental duty is to wage war.

Under the administration of the Red

Cross the Evergreen School expanded and flourished. A review of the "Manual of the Red Cross Institute for the Blind" gives the impression that the School was well organized and was run with a fair degree of economy. From my personal observation I should unhesitatingly say it was efficiently run. The morale of the students was high, the instruction appeared to be good, the men were interested in their work, and the graduates were well trained and proficient in their trades. Many of these men I have followed since their discharge and, all in all, they have been reasonably successful in civilian life. Had the Red Cross continued in charge of the School, it might well have developed into a second St. Dunstan's—a permanent national institution for the training of the blind, and a home for those who are so handicapped that they can work only in shops for the blind. Had this been the outcome of the Evergreen School, we might now be prepared for our present problem.

From January 1, 1922, to the close of the School in June, 1925, the School was under the direction of the Veterans' Bureau, and this was the period of decline. While various indictments may be made against the Veterans' Bureau management, and some may be well substantiated, it is very doubtful if, under the existing circumstances, the outcome could have been much different. In the first place, the Veterans' Bureau was a newly created organization, charged with a tremendous task, and it was probably inevitable that there should be some unevenness in its early organization. Second, as far as the students were concerned "the cream was off the milk." The 117 men admitted when the School was known as General Hospital No. 7 were battle casualties who were the aristocrats and elite of the student body. The men admitted under the Red Cross administrations were partly battle casualties, and partly men who had lost their sight through accident or disease. As the School went on, the percentage of battle casualties decreased, the number of syphilitics and psychoneurotics became greater. With the removal of military status and the decline in the caliber of the student body, discipline became a vexatious problem. The men were all objects of sympathy, and, except for their blindness, were generally in excellent physical condition. They had all the natural appetites and desires of healthy men of their age. Their blindness largely cut them off from general public life and the usual social contacts, and likewise prevented their finding an outlet in other pursuits—athletics, movies, and the like. Prohibition did not help the situation, for the bootlegger and his usual attendants showed no reluctance to cheer the hours of idleness that hung heavy on the blind man. Disorders of one type or another were not infrequent. While it is quite true the trouble-makers were in the minority, nevertheless in the closing years of the institution they kept things more or less agitated and seriously interfered with the general morale of the institution. Third, the Veterans' Bureau was not charged with the perpetuation of the Institute for the training of the blind nor of permanent shops for the blind. The National Rehabilitation Program was terminated by law in 1926. Several years before the actual winding-up of the School, it was known that it was only a question of time before the institution would be closed. Competent instructors sought and found other positions. The replacements were not especially interested in their make-shift and temporary appointments. With the decline in the quality of the students and caliber of the teaching staff, the morale sank to a low ebb and discipline became lax and almost nonexistent. It must be admitted that the

closing months of the Evergreen School were neither spectacular nor stimulating. Yet, I doubt if the fault was due as much to the Veterans' Bureau administration as it was to factors beyond their control, especially to the fundamental policy of terminating the vocational rehabilitation program for the blind.

Since it will probably soon become imperative that an institution similar to Evergreen be again established, how can the conditions that characterized its somewhat dreary ending be avoided? The training of the blind disabled veteran is by law a direct responsibility of the Veterans' Bureau and falls to the Division of Vocational Rehabilitation. It is to this agency that one must look first for a solution of the problem. There are at present in the Vocational Rehabilitation Division some limited facilities for the training of the blind, but it would appear these are inadequate for a task of the magnitude of the present one. Many of the men blinded in this present war will, like other blind men, be incapable of self-support or sustenance in civilian life, and will be of the class who can work only in supervised shops for the blind where they may work out their lives at maximum usefulness to themselves and society. Others, after completion of their vocational training, will adjust themselves to civilian life. It would seem, therefore, that the wisest step would be to establish a national institution for the blind veterans, which would combine a vocational training school and a permanent home and workshop for such of the blind as may require institutional protection. If the Division of Vocational Rehabilitation of the Veterans' Bureau decides to adopt some such plan and is permitted by law to carry it out, the problem will probably be solved and an institution may result which will be comparable to St. Dunstan's in England, with its splendid record of achievement. Were such an institution established it might well be expanded to train and care for the blind who are the charge of other Federal agencies. This at the moment seems to be the logical solution of the problem and it is to be hoped that some such constructive policy will be adopted. The alternatives appear to be amplification of the existing facilities of the Division of Vocational Rehabilitation, the enlisting of the services of some private agency, or the creation of a new subdepartment to handle the question.

An amplification of existing facilities in a veterans' hospital does not appear to be a wise solution. In a recent report, Davenport,[11] the medical officer of St. Dunstan's, has well emphasized that the essential point in the rehabilitation of the blind veteran is that he be first in a community in which all are much on the same basis, where the physical set-up—guide rails, bumpers in the corners of the walls, and so forth—is especially adapted to his peculiar problem, and where he is free from the tendency of others to do too much, or occasionally too little, for him. In a general hospital, the blind man is more or less in contact with patients who are not visually disabled. Undue attention on the one hand, or the careless leaving of chairs in unaccustomed places, or doors ajar on the other hand, are apt either to increase his dependence or to shatter his growing confidence through a bad crash. If the blind man is surrounded entirely by companions who face the same general problem he does, he becomes one of a community, the restoration of his self-confidence is aided, and his physical and vocational rehabilitation is hastened.

The second alternative—enlisting the support of an outside agency such as the Red Cross—has certain points in its favor and also some obvious objections to

it. The record of the Red Cross administration of the Evergreen School was admirable, and St. Dunstan's in England has reached its present enviable position as a privately supported institution. Yet the question may well be asked why a private organization, supported by public subscription, should undertake a task that is obviously the responsibility of a government agency. Should such a national institution for the blind be established under private or semipublic auspices, the Division of Vocational Rehabilitation might theoretically enlist its facilities on a contract basis. This, however, might well lead to an obvious division of authority and responsibility, and the continuity of financial support would not be assured. These might not be unsurmountable difficulties, but, barring some compelling reason for such farming-out of Veterans' Bureau responsibilities, they would appear to be valid objections.

The creation of a new government agency or subdepartment of an existing agency to handle the problem seems to be an unnecessary complication, since the machinery to handle the solution already exists. Suggestions have already been made for the establishment of a National Institute for the Blind, as an independent organization under either government or semipublic auspices. The need for such an independent or semi-independent institution has not yet been demonstrated. That there is an immediate problem for solution cannot be doubted, but, with the existing machinery in the Division of Vocational Rehabilitation of the Veterans' Bureau, it is to be hoped that a satisfactory answer can be found and the mistakes of the last war in the handling of the problem of the blind can be avoided.

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CORNEAL-VASCULARIZATION PROBLEMS*

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About 150 years ago, Soler[1] noted that in pellagra the eyes might appear rheumy, and that the cornea might be involved in an inflammatory process the severity of which bore a relation to the state of the general disease.

In 1939 Bessey and Wolbach[2] observed that "vascularization" of the cornea is an early and constant phenomenon in albino rats that are riboflavin deficient. This manifestation precedes all other demonstrable lesions due to the deficiency. Johnson[3, 4] made similar observations at about the same time. In 1940 Sydenstricker, Sebrell, Cleckley, and Kruse[5] reported on two large series of malnourished patients with cheilosis and corneal changes who were studied intensively by the slitlamp technique. Johnson and Eckardt[3] made a similar study on the corneal disorders in acne rosacea. The entire problem has been reviewed extensively by Wagener[6] and requires no discussion at present.

This report is concerned with an extensive study of the corneas of 711 patients seen in the Nutrition Clinic in Birmingham, Alabama, during 1940 and 1941, and in the Out-patient Department of the Ophthalmic Department, College of Medicine, University of Cincinnati, in 1942.†

In the conjunctivoscleral wedge covering the peripheral rim of the cornea a more or less extensive meshwork of vessels is normally present. It is derived from dichotomically dividing and repeatedly anastomosing conjunctival vessels, and has connections with episcleral and even intrascleral vessels more peripherally. According to Duke-Elder,[7] whom we are quoting here almost word for word, this wedge occupies an area corresponding—in cross-section—to a triangle, the apex of which lies at the termination of Bowman's membrane, whereas its base abuts against the episcleral tissue and the superficial part of the sclera. Here the anterior ciliary arteries form a rich anastomosis, ending in a series of arcades that give off final branches. These marginal loops bend around on their own tracks to form venules leading into a venous plexus built up on similar lines. The anterior ciliary arteries, coursing along the tendons of the recti muscles, send off anterior conjunctival vessels just before they pierce the globe. These anastomose with the posterior conjunctival offshoots to form the pericorneal plexus.

From this pericorneal plexus vascular arcades are given off which enter the transilluminable part of the limbus, so that their final loops seem to be situated in transparent tissue that is merely the conjunctivoscleral wedge and not corneal tissue. The pericorneal plexus lies around the region of the limbus on two planes; namely, the superficial and the deep limbal loops. Imbedded in the conjunctivoscleral wedge, the superficial limbal loops may extend into this transparent zone for 2 mm. in the upper and lower limbal sectors (Leber[8]), while nasally and temporally they do not penetrate so far. The deep limbal loops do not form a continuous network; they enter the corneal tissue

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† The patients observed in Birmingham were referred for the eye examination by the director of the Nutrition Clinic, Dr. T. Spies and (or) by his assistants, Dr. W. Bean and Dr. R. Vilter.

more widely separated from each other, forming simple loops or more complicated patterns with anastomosing branches. They are situated between Bowman's and Descemet's membranes, sometimes very close to the latter. Some of them accompany the corneal nerves for a short distance. In biomicroscopy, they

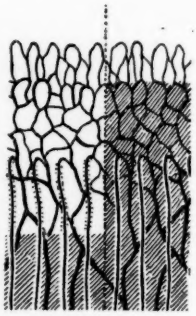


Fig. 1 (Vail and Ascher). Schematic drawing showing the limbal loops in direct and retroillumination; in the latter, many arcades seem to be situated in the transparent area (from Vogt,[9] a modified redrawing).

are not so often visible as are the vessels of the superficial limbal plexus. Indirect illumination occasionally reveals more of them, due to the partial translucency of the scleral tissue bordering the limbus proper (figs. 1 and 2).

Physiology of the limbal loops

The superficial marginal plexus often shows a granular blood stream with varying limpid gaps between longer or shorter groups of red blood corpuscles. Frequently, however, the loops are entirely free of blood cells. This seems to be the usual state of the most distally situated loops. Absence of red corpuscles was believed to be an indication of emptiness of these loops. It is improbable, however, that they are entirely empty at any time, since they are imbedded in a relatively firm tissue. On the slightest stimulus they rapidly fill with red blood corpuscles, as in inflammation or engorgement. Irritation from a small foreign body caught between the lid and bulbus, or even rubbing of the lids, suffices to fill with red cells, at least temporarily, smaller or larger groups of previously invisible loops (Vogt[9]).

We shall not, at this time, discuss the nature of the fluid that fills the apparently empty loops; it may be blood plasma, which is supposed to fill capillaries free of corpuscles in other parts of the body (Bordley[10]), but it is possible that in this region the blood plasma is diluted at a varying ratio by aqueous humor leaving the canal of Schlemm by numerous small outlets the majority of which are regularly invisible (Ascher[11]).

Limbal hyperemia

Any hyperemia in the limbal meshwork should be judged—(1) for its intensity, and (2) for its extent. The intensity of hyperemia can be estimated biomicroscopically by the density, or calculated by the number, of individual vessels visible in a single microscopic field. On the other hand, the extent of limbal-mesh-

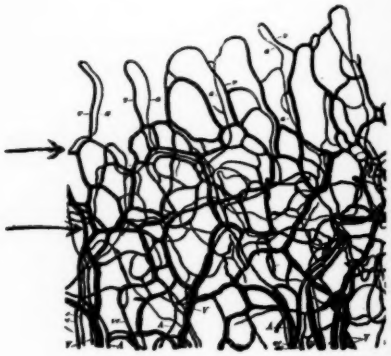


Fig. 2 (Vail and Ascher). Showing an injected specimen of the limbal meshwork. The vessel sections which, by engorgement, may form concentric collaterals are clearly visible. *A*, episcleral branches of anterior ciliary arteries; *V*, episcleral branches of anterior ciliary veins; *a*, arterial limb of marginal loops; *v*, corresponding venous limb; *ac*, *ve*, anterior conjunctival arteries and veins (from Leber[8]). Arrows indicate possible concentric collaterals.

work hyperemia is to be judged by the number of arcades actually filled by blood corpuscles (figs. 3 and 4).

Differentiation between intensity and extent of limbal-meshwork hyperemia has not been attempted in ophthalmology up to this time, but such differentiation is justified by observation of many hundreds of limbi and may help in the classification of puzzling conditions observed in this region. The intensity of the hyperemia of the limbal meshwork parallels the severity of the causative pathologic process. The extent of the hyperemia of the limbal meshwork is dependent on the duration of the disease. As a more intensive conjunctival process develops, and as the bulbar conjunctiva becomes involved, a larger number of limbal loops becomes filled with red blood corpuscles. When an acute process recedes, only the proximal arcades remain filled with red blood cells while the more distal ones become free of red corpuscles unless there has been an inflammation of longer duration.* Involvement of the corneal tissue induces not only filling of even the most distal arcades, but genuine vascular proliferation into the corneal tissue proper (fig. 6 and stereophoto 5).

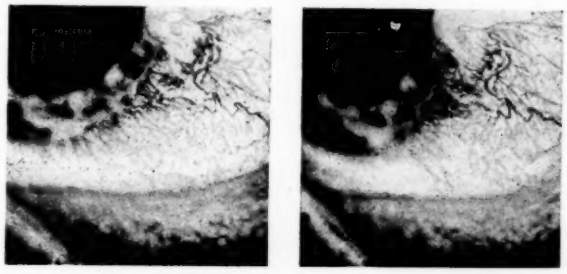


Fig. 5 (Vail and Ascher). Stereophoto of the right eye of Aldie C., a white woman, aged 32 years, first seen on May 4, 1941, with right nasal pterygium and the right semilunar fold drawn toward it, out of the nasal angle. Congestion of the bulbar conjunctivas was present in the exposure region of both eyes. On June 6th, a marginal ulcer in the right nasal lower corneal quadrant, not far from the head of the pterygium, was observed. Vessels approached but never reached the ulcer. Diagnosis: riboflavin deficiency. Note the extensive filling of the limbal loops, combined with low intensity of congestion.†

Fig. 6 (Vail and Ascher). Showing real corneal vascularization. This occurs only if and where corneal pathology is present. Only in these cases do newly formed vessels enter the corneal tissue proper, and in only such cases do vessels trespass on the preformed limbal meshwork.

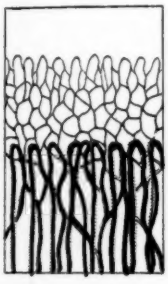


Fig. 3

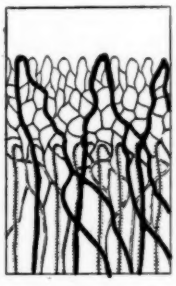


Fig. 4

Fig. 3 (Vail and Ascher). Showing intensive hyperemia in the limbal loops. In this case the extent is very low; the distal meshwork is practically empty, but the proximal vessels are maximally filled.

Fig. 4 (Vail and Ascher). Showing limbal hyperemia of medium intensity and high degree of extent; not all proximal limbs are filled, but blood is visible in some of the most distal arcades.

Pathology of the Limbal Loops

So long as no real vascular proliferation takes place the expression "corneal

* In distinguishing the arcades we prefer the expressions "proximal," that is, closer to the equator bulbi, and "distal," that is, closer to the corneal center, instead of "peripheral" and central."

† Stereophotos were taken by Mr. Bennett, of Chicago, in June, 1941.

vascularization" should be avoided, regardless of the fact that filled vessels are present and visible in a transparent tissue.

Sydenstricker and his co-workers deserve credit for having directed our attention to a certain form of congestion in this region described as corneal vascularization due to vitamin deficiency.

In 1940 Sydenstricker[5] stated that the cornea is actually invaded by very small capillaries arising from the apices of loops surrounding the scleral digitations. In 1941[12] he described, as the first and possibly only sign of riboflavin deficiency, the following observations, made by means of a corneal microscope with the slitlamp: "The normal avascular zone between the plexus and the sclerocorneal junction is overrun by minute vessels from which spring capillary loops which outline the scleral digitations." Later he stated: "We have not observed an instance in which an arcade of capillaries framing the scleral projections has not been proved to be abnormal." The development of these vessels has been followed closely under experimental conditions. "Within a few days, often only two, empty capillaries can be seen arising from the apices of the loops outlining the scleral projections. These capillary sprouts lie immediately beneath the corneal epithelium and extend centripetally. In two or three days more they form complete loops through which red cells circulate irregularly and in clumps. The efferent limbs of such loops are often difficult to see. Such vessels grow rapidly and anastomose with adjacent capillaries to form a secondary arcade of loops lying within the cornea. From this, more sprouts develop and grow centripetally with many anastomoses until an extensive superficial plexus is formed which may cover the peripheral two thirds of the cornea. Later, and usually after several recurrences of ariboflavinosis, vessels may invade the substantia propria at all levels . . . usually only after prolonged deficiency, diffuse nebulae develop at various levels in the substantia propria."

Amos[13] found a higher percentage of ocular changes in a "sea-going" group of the Canadian Naval Service than in the "barracks" group. Difference in diets in both groups is mentioned, but there is no mention as to whether this "sea-going" group really was exposed to the ill effects of the sea climate or only to dietary insufficiency.

MacDonald[14] stated that he had observed a greater incidence of "severe ariboflavinosis according to the present diagnostic technique with the slit-lamp" in men of the Royal Navy who had been at sea for longer periods. Among 100 men who had been subsisting on a carefully checked diet, there were a few cases of mild corneal vascularization.

Personal observations

Comparing our observations on patients in the Nutrition Clinic in Birmingham, Alabama, with the conditions described by Sydenstricker, we found a large number of cases of conjunctivitis, some without and many with involvement of the bulbar conjunctiva. Where the bulbar conjunctiva was involved, varying degrees of engorgement of the limbal meshwork were observed. Entrance of newly formed capillaries into corneal tissue proper was never encountered except in cases with antecedent corneal disease. In the limbal meshwork, however, there was a peculiar formation which attracted our attention and raised the question of its possible association with vitamin deficiency.

While normally any limbal loop possesses both an afferent and an efferent limb (fig. 2), in numerous patients many afferent and very few—sometimes only

one—efferent vessels were found in each quadrant of the limbal circle. This is contrary to the normal condition described by Krueckmann,[15] who believes that most of the pericorneal plexus is venous in character (fig. 7).

We became convinced that, except in corneal diseases, the condition described as corneal vascularization is merely an engorgement of the preëxisting limbal plexus. In some instances these vessels finally form shorter or longer continuous efferent branches along, and paralleling, the limbus. For these vascular features, which up to this time have not been satisfactorily described and even less satisfactorily explained, the term "concentric collaterals" is proposed.

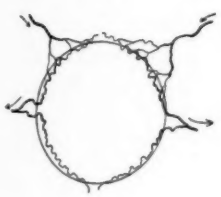


Fig. 7 (Vail and Ascher). Fully developed concentric collateral. All venous blood is collected in the single anastomosing vessel running toward the horizontal meridian.

Definition

Concentric collaterals are engorged parts of the preëxisting limbal meshwork. They are charged with the collection of blood from all limbal loops of one entire limbal quadrant, or a part of them, and with the return of this blood from the limbus to the larger conjunctival veins (figs. 7, 8, 15, and stereophoto 10*).

Nomenclature

In Stedman's Medical Dictionary (1939) as well as in the Oxford English Dictionary (1939) and in Funk and Wagnall's Dictionary (1928) vascularization is defined as the formation of new blood vessels, or as the conversion to a vascular condition. It is obvious that the limbal concentric collaterals do not correspond to this definition. The usual term for pathways formed by dilatation of preexistent narrower vessels which thus allow a new although preformed direction of circulation is "collateral."

Fig. 8 (Vail and Ascher). Showing an incomplete concentric collateral. The blood returns by individual venous limbs in the region between the 12- and 1:30-o'clock position. From here down to the 3-o'clock position all blood is collected by an anastomosing vein which runs parallel to the limbus.

Appearance

A fully developed concentric collateral starts near the 12-o'clock position in the upper or/and near the 6-o'clock position in the lower limbus and proceeds, in a somewhat tortuous route, toward the nasal or temporal horizontal meridian here to join conjunctival veins running toward the semilunar fold or toward the temporal canthal region (fig. 7 and stereophoto 10).

Fig. 9 (Vail and Ascher). Showing a progressive concentric collateral. Arcades situated distally from the primary anastomosing arc are being filled.

Rudimentary concentric collaterals do not comprise the whole quarter of the limbal circle, and in these cases the finally efferent vein does not become so large

* Some weeks after the presentation of this paper, a description of limbal vascularity by Graves (Brit. Jour. Ophth., 1934, v. 18, pp. 305, 370) was incidentally found that pertains to structures similar if not identical with the concentric collaterals. A picture showing these vessels is reproduced with the legend Normal Limbus (fig. 1, p. 312).

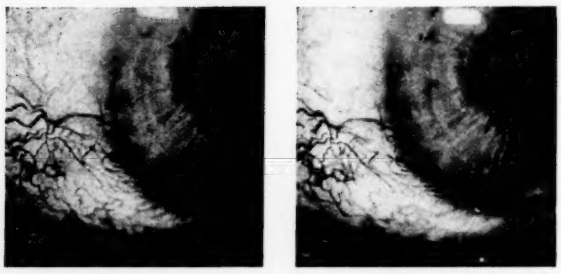


Fig. 10 (Vail and Ascher). Stereophoto of the left lower nasal concentric collateral of Myrtle B., a white woman, aged 42 years.* The collateral covers almost the whole quadrant. The diagnosis of the Nutrition Clinic was riboflavin deficiency. The patient gave a history of "red eyes" since childhood, of burning, watering, photophobia, and hemeralopia for many years. Her diet was very high in food containing vitamin B. She had been taking vitamin-B preparations for many months. Her mother died of tuberculosis. The patient had not had any serious disease since 1925, at which time an appendectomy was performed. X-ray examination of her chest gave evidence of "old lesions." There was papillary hypertrophy in her tarsal conjunctivas, slight injection of the latter as well as of the fornices and semilunar folds. Pingueculas were present in the nasal conjunctiva of both bulbi, and hyaline and calcareous deposits in both bulbar conjunctivas. In July she developed cheilosis of both angles.

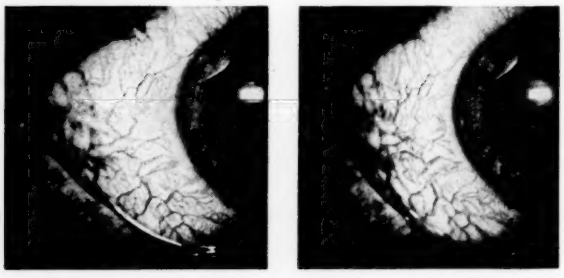


Fig. 11 (Vail and Ascher). Stereophoto of the incomplete concentric collateral in the right eye of Joe H., a white man, aged 35 years. The diagnosis of the Nutrition Clinic was nicotinic-acid deficiency. He showed a slight injection of all parts of the conjunctivas, particularly in the exposed bulbar conjunctival areas. Numerous hyaline and a few lipoid deposits were present in his bulbar conjunctivas. Four pingueculas were present. The limbal loops were partially filled. In the right temporal upper quadrant, between the 10- and 11-o'clock positions, the venous return from all limbal loops was provided by a concentric anastomosis finally joining a large vein in the horizontal meridian. In the picture the right temporal pinguecula is almost invisible.

* The connection between the concentric collateral and the vein in the horizontal meridian, in this picture, is not so clearly visible as when viewed with the corneal microscope.

and conspicuous as in the cases in which involvement of a whole quadrant is present (fig. 8 and stereophoto 11).

Being formed out of arcs of the limbal meshwork, the concentric collaterals look like a series of elements that are convex toward the corneal center. Sometimes, however, they may be concave for the whole or a part of the concentric collaterals, due to apparent extensions in the central direction (figs. 9 and 16). Exact observation shows that these extensions are more distally situated loops with arterial branches so fine that only the larger venous limb may be easily visible, and thus the erroneous impression of a single vessel projection instead of a loop may be produced (fig. 12).

Occurrence

During the summers of 1940 and 1941, in 642 patients of the Birmingham Nutrition Clinic who had deficiency diseases of varying degrees of severity, 85 were observed to have concentric collaterals but not a single case of corneal vascularization in the absence of previous corneal disease, as evidenced by infiltrations, ulcers, or scars, was seen. These observations are in accordance with those of Julianelle and Lamb,[16] who found capillary branches budding off from the limbal loops and running between the corneal lamellae only where foci of necrosis were present, and with the findings in pathologic conditions of the cornea in general. Also in interstitial keratitis, corneal disease precedes any vascularization (Duke-Elder).

In the Birmingham group the in-

cidence of concentric collaterals was about 13.3 percent.

The youngest patient manifesting concentric collaterals was seven years old, but it was not always possible to examine younger children with the corneal microscope. The oldest patient in this group was 66 years old. There were 11 patients less than 16 years of age, 26 patients between 16 and 50 years and 7 patients older than 50 years.

Analysis of 44 cases with concentric collaterals

Between April 26 and July 14, 1941, more exact studies were made on 44 patients, 4 of whom had shown concentric collaterals the previous year. Of these 44 patients chosen at random, 13 were male and 31 female. A diagnosis of vitamin deficiency was made by the physicians of the Nutrition Clinic. The following types of deficiency diseases were found:

Riboflavin deficiency	12 instances
Nicotinic acid deficiency	13 instances
Thiamin deficiency	2 instances
Subclinical deficiency	8 patients
Questionable or no deficiency	13 patients

No amount can be calculated from these figures which, in part, correspond to single individuals and, in part, to kinds of deficiency that may overlap in one and the same person.

Four patients were addicted to alcohol; two had pulmonary tuberculosis; two had acne rosacea; and in one 13-year-old girl who had enormous follicular conjunctivitis a severe vulvitis was found. The presence of Bitot's spots was observed in four patients, in two of whom they were bilateral.

As to the history of these 44 patients, 32 were aware of signs and symptoms of conjunctivitis. Some stated that the recurrences of these symptoms coincided with recurrences of stomach disorders.

Photophobia was present in more than one half of the patients (24), and hemeralopia in about one fifth of them (9).

Fig. 12 (Vail and Ascher). Enlarged reproduction from the photo chrome picture* of the right eye of Lucille Fr., white girl, aged 14 years. Diagnosis of the Nutrition Clinic: no definite deficiency. When this picture was taken, her conjunctivas did not show any recent inflammatory changes except a slight nasal thickening of both bulbar conjunctivas; she gave a history of previous eye trouble such as watering and redness. In spite of her youth, an incipient pinguecula was present temporally from the cornea of the left eye. In the bulbar conjunctivas hyaline and calcareous deposits were found on biomicroscopy. Lacrimation was rather quick (Schirmer's test, 22-55). Corneal hyperesthesia was present. This patient was observed for more than nine weeks—May 17 to July 24, 1941—and it seemed that during July the concentric collateral became fuller and that some distal loops became filled just during that month. The arrow indicates one recently filled arcade situated closer to the corneal center; this loop, as well as the whole concentric collateral, consists of engorged parts of the preformed limbal meshwork, which in young people tends to be more extensive than in later life. In this illustration, light reflexes interfere with the visibility of parts of the vein draining the concentric collateral.

Objectively, none of these 44 patients was entirely free from conjunctivitic signs, as is shown in the following table:

	Patients
More or less marked injection of all parts of the conjunctiva	23
Injection confined to the exposed region of the bulbar conjunctiva	17
Papillary hypertrophy of the tarsal conjunctivas	22
Congestion of semilunar folds	13

* Taken by Dr. Mann, of Cleveland, in July, 1941.

Follicular hypertrophy	12
Isolated thickening of nasal bulbar conjunctiva	11
Slight conjunctival discharge	8
Abundant conjunctival discharge	4

In 5 of the 12 patients with follicular conjunctivitis, the follicular hypertrophy was very extensive, including parts of the bulbar conjunctiva and of the semilunar fold. Pannus and tarsal scars were not found in these patients. Only one of them had small scars in his upper tarsal conjunctiva but no pannus.

Isolated thickening of the nasal bulbar conjunctiva was present in one fourth of the 44 cases studied intensively, but occurred in less than one sixth of the 642 patients.

The following changes were observed in the cornea:

	Patients
Bilateral superficial keratitis	2
Corneal scars of different types	7
Rapidly drying areas of exposed corneal epithelium	4
Bilateral pterygium	4

Superficial keratitis occurred in only 3 of 642 patients; in the group exhibiting concentric collaterals, keratitis was markedly higher, being present in 2 of 44 patients. Pterygium was observed in 8.23 percent of the whole group of patients. It occurred in one eleventh of the cases with concentric collaterals.

Corneal sensitivity was tested in 25 patients of this group. Three of them had hypoesthesia and two hyperesthesia of both corneas.

On biomicroscopic observation, 31 patients showed deposits in the bulbar conjunctivas, and 18 patients had pingueculae, which were chiefly bilateral. The conjunctival deposits were:

	No. of Patients
Quartz-gravellike, hyaline	27
Roundish, yellowish, probably the "fatty spherules" of Vogt	2
Grayish tuff-stonelike, probably calcareous	2

The high occurrence of pingueculae and of peculiar deposits in the bulbar conjunctiva of the patients observed in Birmingham has been striking since the introduction of biomicroscopic eye observations in the summer of 1940.

Special attention was directed to the limbal loops in the region where concentric collaterals had not absorbed their individual existence. In these 44 patients—

	No. of Patients
The limbal loops were well filled	11
The limbal loops were partially filled	11
No unusual appearance was noticeable	22

This fact is further evidence that intensity and extent of hyperemia in the limbal meshwork are somewhat independent of each other.

While the concentric collaterals occurred more frequently (in 25 patients) in both eyes, and in more than one quadrant of each of them, there were 19 cases exhibiting unilateral concentric collaterals only. It would seem that in these unilateral cases antecedent conjunctival disease is developed more on the side where the collateral is present, but further repeated observations should be made before definite conclusions can be drawn.

There is an interesting difference in the frequency of location of the concentric collaterals. While the localization in the upper half occurs 4½ times more frequently than that in the lower half, localization in the nasal limbus was 5½ times as frequent as it was in the temporal. This difference is not due to the manner of investigation, since in the usual position of the movable slitlamp arm, the nasal limbus is more easily seen in retroillumination than is the temporal limbus. Errors were avoided by frequent observation with the slitlamp arm swung to the nasal side of the observed eye, instead of the usual temporal position. Moreover, the

appearance of concentric collaterals was, after a short time, so familiar to us that we could recognize them readily with direct illumination. Accordingly, there must be other reasons for the prevalence of the localization of concentric collaterals in the upper and in the nasal half of the limbus.

Analysis of 69 cases of concentric collaterals seen in the Cincinnati Eye Clinic

In the spring of 1942, 69 patients of the Out-patient Department of the Ophthalmic Department, College of Medicine, University of Cincinnati, were examined with respect to their limbal and corneal vascularization. These patients were selected at random from the refraction cases and from the clinic. Acutely inflamed eyes and those with corneal disease were excluded. Investigation by means of the corneal microscope was made with the slitlamp arm swung in the position that allowed retroillumination of the limbus under observation. Three degrees of limbal vascularity were distinguished: degree 1, well-filled limbal loops; degree 2, incomplete concentric collaterals (fig. 8); and degree 3, complete concentric collaterals. Each quadrant of any cornea was registered separately in a kind of punch-card system showing eight squares for each patient. These squares corresponded to the nasal and temporal, upper and lower, quadrant of the right and of the left eye, respectively. Using the figures 1, 2, or 3, we recorded the highest degree of vascularity observed in the particular quadrant. Eyes with at least one quadrant showing degree 3, or at least two quadrants showing degree 2, or with four quadrants showing degree 1, were considered to be positive. Filling of a few unconnected limbal loops may be found in any eye, and was considered, in accordance with Vogt and Duke-Elder, as a normal finding.

The individual records for single patients contained, besides the number and name, mimeographed categories for noting race, sex, age, general and ocular diagnosis. Further categories included a description of the lids, lacrimal apparatus, tarsus, fornix, semilunar fold, bulbar conjunctiva, cornea, discharge. Spaces for history were provided, and special regard was directed to photophobia, hemeralopia, and paresthesias.

The patients were investigated and the findings recorded without any questioning as to dietary habits. These facts were recorded by another person* in our absence. Attention was given to the intake of food rich in vitamins. Patients drinking at least two pints of milk daily, eating at least two helpings of vegetables or potatoes daily, at least one egg and one square of butter daily, carrots at least once a week, fruits at least once a day, and meat daily were considered to have an adequate vitamin intake.

Persons with an intake of less than half a pint of milk daily, less than one egg daily, less than one square of butter daily, less than one vegetable plate daily, and meat less than three times a week were recorded in the group of poor diets. Among 69 patients, 24 belonged to the group receiving a good diet, and 28 to that on a poor diet, whereas 17 were left to make up a group getting a medium diet. As far as possible utilization and requirements were considered.

Thirty-one among 69 patients showed typical complete concentric collaterals in one or both eyes. Six others showed a larger amount of incomplete concentric collaterals or limbal loops filled to a high degree. Thirty-two patients showed only a few or no limbal loops filled with blood.

Among 37 patients with concentric collaterals or markedly filled limbal loops,

* We are greatly indebted to Mrs. Elizabeth Ascher for her unselfish collaboration.

25 displayed this sign in both eyes, whereas 12 showed it unilaterally.

The age limits of the whole group were between 7 and 80 years, as follows: 30 patients up to 15 years of age, 19 patients between 16 and 30 years, 13 patients between 31 and 50 years, and 7 patients older than 50 years.

The following table shows the distribution of ages in the positive and in the negative group:

AGE GROUPS

Age	*Positive Cases*	*Negative Cases*
Up to 10 years ..	4	4
Up to 15 years ..	8	13
Up to 20 years ..	8	3
Up to 30 years ..	7	1
Up to 50 years ..	5	5
Up to 80 years ..	5	6

So far as the race is concerned, the distribution of positive and negative cases was as follows:

	Positive Cases	*Negative Cases*
White race	27	12
Black race	10	20

As to sex, 23 patients were male and 46 female. The distribution of positive and negative cases according to sex is shown in the following table:

	Positive Cases	*Negative Cases*
Males	9	14
Females	28	18

The following table shows the distribution of the concentric collaterals over different limbal regions. Concentric collaterals and extensive limbal loops were observed in 37 patients (62 eyes), showing this vascularity.

	Times
The nasal limbus was involved	57
The temporal limbus was involved	28
The upper limbus was involved	52
The lower limbus was involved	42

The distribution of positive and negative cases in the dietary groups was as follows:

	Diets		
	Good	*Medium*	*Poor*
Positive cases 14	12	11	
Negative cases 10	5	17	
Positive bilateral 10	10	5	
Positive unilateral 4	2	6	

In a distribution similar to that observed in the cases in Birmingham, the Cincinnati patients showed slight conjunctivitic signs in those eyes that had concentric collaterals. Here again the tarsal conjunctivas were almost always involved, whereas the bulbar conjunctiva and semilunar fold showed injection only in about one half of the patients with concentric collaterals.

COMMENT

Sydenstricker's illustrations, as well as his descriptions, suggest that what he termed corneal vascularization is nothing more than extensive engorgement of the preëxisting limbal meshwork except in cases of obvious corneal disease. This interpretation seems to be contradicted by Sydenstricker's observations that the corneal vascular plexus formed in cases of ariboflavinosis may cover the peripheral two thirds of the cornea. So extensive a vascular plexus has not been observed in the patients in the Nutrition Clinic in Birmingham, nor among the patients studied in Cincinnati. Local environmental conditions might be responsible for this difference. In regard to the singularity of so extensive a vascular proliferation, two possible sources of error should be considered: the occurrence of nebulae in these corneas, mentioned by Sydenstricker, is an indication that before these scars could have been formed keratitic changes of either infiltrative or ulcerous character must necessarily have preceded the formation of the nebulae. Once keratitic changes appear, the new formation of capillaries sprouting off from the limbal loops is understandable. On the other hand, in comparing the extension of any

involvement of the corneal limbus with the unaffected corneal tissue, especially when higher-power magnification is used, the vascularity might be overestimated.

The fact that Sydenstricker observed "the normal avascular zone between the plexus and the sclerocorneal junction overrun by minute vessels" explains the difference between Sydenstricker's point of view and our own. Knowing that there is no "normal avascular zone" between the plexus and the sclerocorneal junction, but a definite vascularity normally present over the entire limbus, we cannot agree with his conception that visible vessels in this region constitute "vascularization."

The anatomic situation in the conjunctivoscleral wedge favors a striking transilluminability of this region when observed with retroillumination. Observed by this means, concentric collaterals contained in the tissue overlapping the corneal rim appear to be situated in the cornea proper and may be mistaken for real corneal vascularization when they are merely a special kind of engorgement in the marginal meshwork (figs. 1 and 15).

It is probable, although not absolutely certain, that there is a causal relation between the situation of the concentric collaterals and that of chronic inflammatory conjunctival changes. In spite of the distance between the limbus on one side and the semilunar fold and upper tarsus on the other side, persistent or marked inflammation in these latter parts may have some bearing on the greater frequency of concentric collaterals in limbal areas adjacent to these regions. As a rule, papillary hypertrophy is seen more frequently in the upper than in the lower bulbar conjunctiva; the semilunar fold is sometimes the only part of the conjunctiva showing injection for a long time after other parts have resumed their normal color. The adjacent area of the nasal bulbar conjunctiva is more prone to develop the isolated thickening that probably is a sign of mild chronic inflammation; pterygia, too, are more often situated in the nasal than in the temporal limbus. Without drawing unfounded conclusions, we may say that the nasal part of the limbus is, for certain pathologic changes, an unquestionable locus minoris resistentiae as compared to the temporal limbus. The same may be true, to a certain degree, of the upper limbus as compared to the lower limbus; here may be mentioned the typical occurrence of trachomatous pannus in the upper corneal area.

An explanation of the engorged limbal loops and the associated concentric collaterals was attempted (Sydenstricker, Johnson) by assuming that "corneal vascularization" is due to lack of the oxygen carrier, and more blood has to be brought to the tissues that are poor in, or entirely devoid of, respiratory ferments. According to Johnson, proliferation of capillaries from the limbus would appear to be an effort to combat localized anoxemia by bringing hemin substances into closer proximity to the tissue. He believed that regression of the corneal vascularization follows riboflavin sufficiency and the restoration of the yellow-enzyme system to its normal position in oxidation.

In a recent and as yet unpublished study on corneal disease in vitamin deficiency the doubt is expressed as to whether increased blood supply might help the respiration of a tissue lacking in the oxygen carrier. However, this objection does not cover the case of partial deficiency of the oxygen carrier; in this condition, increased blood supply might be of value in insuring better respiration. As the result of experiments on rats with riboflavin deficiency Johnson and Eckhardt[8] stated that covering of the cornea with ointment or liquid petrolatum does not hasten vascularization, and hence they conclude that the vitamin itself or the oxi-

dative enzyme derived from it, if deficient, is the major factor in producing vascularization of the cornea in the rat. In the opinion of these observers this experiment supports the assumption of anoxemia as the ultimate cause of capillary proliferation.

Another point to be considered is the following: In the limbal area of human eyes with engorged limbal loops, and even more in those with concentric collaterals, a bright red color, which would indicate the presence of an active hyperemia, is almost never seen. On the contrary, the limbal zone appears dark red or violet, in spite of the absence of a typical deep (ciliary) injection. This dark-red color is due to the venous qualities of the blood present in the loops under discussion. There is more stasis due to engorgement and less or no active afflux, which latter should be expected if and when a greater demand for oxyhemoglobin were present and satisfied. This is the more remarkable in view of the usually bright color in all superficial conjunctival vessels, a fact that interferes with a color differentiation between arterial and venous vessels in this region. Whether this equally red color is due to a possible oxygen intake and carbon-dioxide elimination via the vessel wall and conjunctiva is an interesting question. Two other possible explanations for the normal bright-red color in all superficial vessels are rejected. There is in this region neither a low metabolism nor is the speed of the blood current so high that venous qualities could not become obvious in the blood returning from the arterial limbs of the limbal meshwork.

If visible at all, the current in the concentric collaterals is usually slow, especially in cases of incomplete collaterals. Where a collateral covers a complete quadrant, the blood current may be, but often is not, more rapid. Dilution by clear fluid leaving the aqueous veins[11] could be responsible for the bright color sometimes noticeable in these veins. In this case it would not be caused by the presence of oxyhemoglobin, but by the influx of fluid free from red blood cells.

Whatever the answer to this particular question may be, the expression "corneal vascularization" should never be used for a condition brought about by a dilatation of preëxistent pathways and not by the formation of new vessels. Repeated examination of the Birmingham and Cincinnati patients who had engorged limbal loops and concentric collaterals led us to the opinion that these are not newly formed vessels. An explanation which does not exclude the biochemical point of view, but which is primarily based on considerations of the local vascular anatomy and of the mechanism of blood circulation in the limbal region, appears logical.

After the summer of 1940, visitors to the Birmingham Nutrition Clinic, as well as members of its staff, were shown that the obvious situation of congested limbal loops and of concentric collaterals is in the semitransparent, scleroconjunctival limbal zone, which, under indirect illumination, can be mistaken for a part of the corneal tissue proper, whereas direct illumination shows its continuity with the opaque bulbar coat and the vascularity of the latter (figs. 1 and 13).

Concentric collaterals should be understood as a sequela of an extensive conjunctival congestion of long duration or of repeated occurrence. Whether this conjunctival disturbance is or is not due to vitamin deficiency is another question. The deficiency may be assumed as the main cause or as an additional cause combined with other noxious factors, as microbic or virus infection or exposure to dust, wind, heat, or to certain irradiations, in order to produce the conjuctival disturbance responsible for the formation of

concentric collaterals. Any form of conjunctivitis may lead to congestion in the limbal meshwork, and the more severe it is, the greater the involvement of the bulbar conjunctiva.

The vessels of the bulbar conjunctiva are imbedded in very soft tissue; the closer the vessels are to the limbus, the more firm is the tissue surrounding them. Near the limbus, conjunctival vessels are less movable, and, probably, more resistant to dilatation as well as to collapse. The latter fact is of high physiologic value because of the presence in this region of vital connections between Schlemm's canal and extraocular vessels.

Pathologic conjunctival injection of the bulbar conjunctiva is described as being less marked in the pericorneal region than in the periphery. This fact can be explained by the presence of the most obvious pathologic changes in the tarsal conjunctivas and in the fornices, and to the gradual diminution of injection in the adjacent bulbar conjunctiva. It could also be due, however, to a higher resistance to dilatation in the firmer tissue around the limbus. On the other hand, any congestion in the bulbar conjunctiva of higher degree or of longer duration may finally lead to a dilatation even of vessels situated in a more resistant tissue (figs. 18 and 19).

Such dilatation is probably not a purely passive one, but may be combined with such changes as cellular proliferation in the vessel wall, as suggested by the fact that, on biomicroscopic examination, the individual vessel section finally appears to be two or three times larger than normal loops in this region. We must consider that the surface of a cylinder varies in proportion to its diameter. It is not probable that such an amount of increase could be covered by mere stretching (fig. 15).

For development of these anatomic changes in the limbal vessels, some time is needed. For this reason concentric collaterals do not appear in cases of acute conjunctivitis of short duration even when there is an intense limbal hyperemia, and a certain time must elapse before concentric collaterals become visible in processes of longer duration. After engorgement of low degree or of short duration, single limbal loops become dilated before connection by collaterals takes place. The

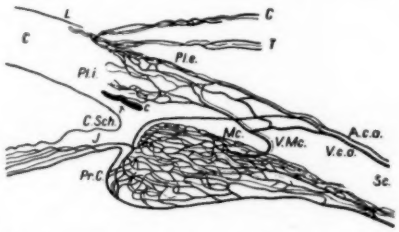


Fig. 13 (Vail and Ascher). Schematic cross section of the anterior segment of the human eye, showing the peripheral corneal rim overlapped by the limbal meshwork.*

same phenomenon may become visible when the etiologic process is receding and the collateral splits off again into single loops (fig. 14). It is obvious that it is not only inflammation that may produce concentric collaterals in limbal meshwork, but any other conditions leading to repeated or long-standing congestion in conjunctival vessels may have the same effect. Tumors or irradiation by roentgen rays or radium may produce similar results.†

An analogy to the formation of concentric collaterals can be found in the human retina after obstruction of branches of the central vein. In the retina, mere inflammation does not produce collateral circulation because of the numerous an-

* Taken from Duke-Elder's "Textbook of ophthalmology," volume 1, page 138, in which it was reproduced from L. Maggiore.

† Concentric collaterals often appear in the limbus where it is adjacent to a chalazion; in these cases, other parts of the limbus that are not irritated by the chalazion do not show the concentric collaterals, neither does the fellow eye when free from congestion.

astomotic pathways available. Collaterals will be formed, however, after thrombotic occlusion. Michaelson and Campbell[17] concluded, from studies of the retinal capillaries, that the anatomically preformed capillary branchings form a sufficient basis for the winding collaterals which appear after occlusion of a retinal venous branch. These investigators assert that it is unnecessary to invoke new budding of endothelial tubes. It is known that all capillaries are capable of undergoing hypertrophy to an enormous extent. Moreover, vessels not much larger than capillaries can normally drain directly into the largest veins. According to Michaelson and Campbell, these two facts are sufficient in themselves to explain the development of the collateral channels. A particular portion of the capillary bed may drain into several veins that are distant from one another. In this way these authors explain the wide wanderings of the new channels, and they reject the assumption of reserve capillaries in the retina.

A similar explanation for retinal collaterals was given by Elschnig[18] as early as 1898. Not only is his picture similar to that of Michaelson and Campbell, but his explanation also refers expressly to dilatation of preëxistent capillary connections, and the term "collateral ways" is used.

On the other hand, once stabilized, anatomic changes will not recede immediately after the cessation of their cause, and this fact explains the persistence of concentric collaterals—and of other forms of vascu-

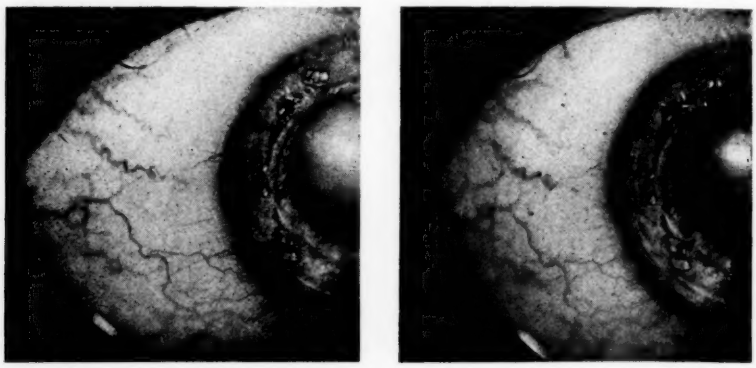


Fig. 14 (Vail and Ascher). Stereophoto showing single dilated loops in the left nasal lower limbus of Harold All., white boy, aged nine years. Diagnosis of the Nutrition Clinic: riboflavin deficiency. The patient had cheilosis. His eyes had been red for two months, and he complained of headache and flickering before his eyes, burning, watering, and defective vision of the right eye.

There was a concomitant convergent strabismus of the right eye. This eye had a hyperopic astigmatism of six diopters, with one diopter more in the horizontal meridian and a congenital glial hyperplasia of the disc of the right eye. The left eye showed a hyperopia of two diopters only.

At the time of his admission, on June 16th, there was a moderate but rather extensive injection of limbal loops in both eyes. Injection of the exposed regions of both temporal halves of the bulbar conjunctiva was present, with slightest epithelial stippling in this region. The corneal sensitivity was reduced in the corneal tissue adjacent to this episcleritic area.

There was a spontaneous subsidence of the injection between June and August, 1941. The extensive limbal loops did not disappear during this time, nor after intravenous injection of 5 mg. of riboflavin on August 7th and 8th.

lar dilatation, such as single limbal loops and aneurysms—after disappearance of the causative factor.

This kind of vascular reaction, slow dilatation, and slow or absent recovery is sometimes present in other parts of the conjunctiva. Injection and papillary hypertrophy develop slowly in the tarsal conjunctiva, for instance, in cases of lacrimal stenosis, and it takes them a long time to disappear after a successful dacryocystorhinostomy.

Papillary hypertrophy is, of course, not an exact analogy to limbal concentric collaterals, but in both cases conjunctival vessels are situated in a firmer tissue and a longer time is needed to reduce the changes produced in these regions than in the soft bulbar conjunctiva. In both conditions not transient functional but durable anatomic changes are present.

Upon observing many cases of concentric collaterals, one may say that their formation indicates the degree of congestion in the limbal meshwork that was present during a previous pathologic condition. The more congestion, the more dilatation takes place, and the closer it will progress to the corneal rim of the sclero-conjunctival wedge. They are genuine collaterals (figs. 15 and 19). Thus, the concentric collaterals form a sort of flood mark indicating the level of the flood after the river itself has regained its former level.

Sometimes the corpuscle content of the concentric collaterals is very low. Even collaterals apparently free of corpuscles are seen. Whether these are to be considered as "emptied" vessels, and just about to be put out of use upon regression of the causative condition, or whether the low blood corpuscle content can be explained by the influx of aqueous veins[11] pouring clear fluid into the prepared vessel bed, can be judged only in each individual case. Seasonal differences are to be considered, but so far there is no convincing evidence of a periodic seasonal filling and emptying of these vascular structures.

Concentric collaterals never should be considered as an isolated or independent vascular phenomenon; they are understandable only on the basis that they are a part of the whole bulbar conjunctival vascularity anatomically as well as functionally.

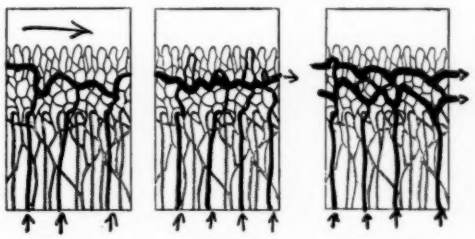


Fig. 15 Fig. 16 Fig. 17

Figs. 15, 16, 17 (Vail and Ascher). Concentric collaterals.

Fig. 15 shows a part of a primary concentric collateral. There is a low intensity of limbal injection, but a higher extent in the direction toward the corneal center, and a marked dilation of the distal area. All blood is collected by the concentric anastomosis.

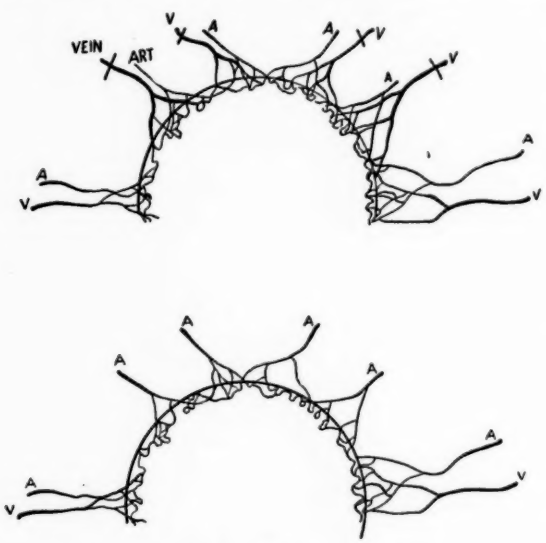
Fig. 16 shows a concentric collateral in progression. Distally situated loops become filled; there is a higher degree of extent in the limbal injection. All blood returns by the primary concentric collateral.

Fig. 17 shows a part of a double concentric collateral. A secondary anastomosis has formed distally from the primary anastomosis. No venous return along the original efferent limbs; all blood is collected by the double collateral, which finally empties into the horizontal meridian vein.

When the etiologic condition continues, or even increases, more loops are filled with blood. This does not mean loops that are newly formed, but loops that were not previously engorged. Thus, little extensions or protuberances will appear distally from the original concentric collateral (figs. 9, 16, 17). Later on these extensions join a more advanced concentric collateral, while the older, more proximal one, may

persist or may be reduced in caliber.

In recent publications, an old mistake reappears which seems to have been eliminated as a result of the argument between Augstein[19] and Stargardt.[20] Using a 10× magnification, Augstein described capillary sprouts in the limbal meshwork the existence of which was definitely refuted by Stargardt. Using the binocular microscope or Czapsky and 35× magnification, Stargardt was always able to see the afferent and the efferent limb of what seemed to be, on superficial examination, a freely ending single capillary sprout. The connection between afferent and efferent limbs, estimated by him to have a diameter of only 5μ, might have escaped the attention of Augstein as well as that of recent observers. Stargardt investigated more than 200 cases with pathologic corneal vascularization, and even in these cases single capillary sprouts were never seen. Nor has our material yielded any evidence of capillary sprouts with a dead end.



Figs. 18 and 19 (Vail and Ascher).

Fig. 18, a schematic drawing showing the development of a concentric collateral. Engorgement in the veins A and V is responsible for an eventual change in the original direction of the limbal circulation.

Fig. 19 shows collateral veins accepting all blood, which now returns along the dilated collateral pathway.

The new concentric collateral has, as a rule, the same direction that the older one had. In a concentric collateral situated in a quadrant of the upper limbus there is almost always a downward direction of blood flow and vice versa. Exceptions to this rule are an extreme rarity, and then they are apparently due to some local impediment in the usual direction of the current. In old concentric collaterals reversed current may occur, according to the changing conditions of pressure potential in different parts of the limbal meshwork. This phenomenon seems to be an indication of impending retrograde involvement of the concentric collaterals, which, in this case, will be split up again into single limbal loops.

After compression of the carotids of a patient with general hypertension, Rollin[21] observed a change in direction of flow in the limbal capillaries. He did not describe a formation similar to the concentric collaterals. His findings, however, indicate the relation of the direction of the current in the limbal meshwork to intravascular pressure changes.

Johnson[4] interprets the development of what we call concentric collaterals in the following words: "Early in their development these vessels are capillary loops, exceedingly rich in Rouget cells, as judged by the marked variation in caliber of vessels, some capillaries being exceedingly small and others markedly engorged with cells. In long-standing disease the vessels tend to lose this characteristic, and appear to acquire something of a vessel wall, It then becomes more difficult to follow them as individual loops." We believe that

the main difference between Johnson's and our own conception is that Johnson did not differentiate between congestion in anatomically preformed limbal loops and real vascular proliferation. This differentiation may be of help particularly in the understanding of the concentric collaterals as derivatives from preëxistent but actually dilated pathways of the limbal circulation.

In a recently completed but not as yet published study concerning aneurysms of the bulbar conjunctiva the incidence of concentric collaterals in the group of cases with aneurysms was found to be about 1 to 10. A mechanical explanation of the dilatation of the vessels seemed in many of them to be obvious. There is often a crossing of the aneurysmic vessel by another vessel, and thus, by compression, a local engorgement and subsequent dilatation may be produced (fig. 20). Aneurysms are found in afferent as well as in efferent limbs of limbal loops (fig. 21) in adjacent arterioles or venules.

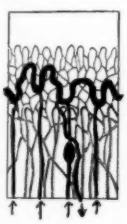


Fig. 20

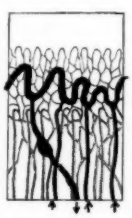


Fig. 21

Figs. 20, 21 (Vail and Ascher).

Fig. 20, aneurysmatic dilation of an afferent limb.

Fig. 21, aneurysmatic dilation of an efferent limb.

The foregoing statement does not imply that all aneurysms of the bulbar conjunctiva can be explained by mechanical obstruction and consequent increase of the diameter in a circumscribed part of the vessel.

No changes in limbal concentric collaterals were noted after repeated administration of 2, 3, and 5 mg. of riboflavin. Even single, and unconnected, limbal loops often did not disappear after most intensive riboflavin therapy in spite of the simultaneous clearing up of the bulbar conjunctiva. Observations of this kind suggest the assumption that anatomic changes in these loops have taken place due to a previous long-standing engorgement, as discussed elsewhere, and again justify the differentiation between the conceptions of the extent and intensity of limbal hyperemia. The intensity of limbal hyperemia may be reduced by riboflavin administration, whereas the extent of limbal hyperemia apparently is not so influenced.

In the patients observed in the Cincinnati Eye Clinic, the percentage of eyes with concentric collaterals was markedly higher than in the Birmingham subjects. Patients visiting the Out-patient Department of the Cincinnati General Hospital belong to a low-income group. We would expect, however, that, in case of a vitamin-deficiency etiology, the frequency of concentric collaterals should be higher in patients of the Nutrition Clinic in Birmingham, where deficiency is believed to be endemic.

There are other differences between the Birmingham and the Cincinnati group. In Birmingham, for example, Negro patients were a rare exception, whereas in the Cincinnati group the number of white and of colored patients observed was about equal. In Negro eyes, pigmentation in the limbal region sometimes interferes with the visibility of the limbal loops. Thus, it could be possible that more eyes in the Cincinnati group had concentric collaterals which, however, were not detected due to the racial pigmentation.

The frequency of concentric collaterals in white and colored persons was reciprocal: about two thirds of the observed white patients had concentric collaterals,

while only four sevenths of the colored patients gave positive findings. Whether this difference may be due to the limbal pigmentation or to other causes is an open question.

A definite difference in the distribution with regard to sex was obvious in the Birmingham as well as in the Cincinnati material. The proportion of positive and negative cases in the male group was about equal to one to two. In the female group, this proportion was about three to two.

A predominance of the nasal and of the upper limbal region was present in both the Cincinnati and the Birmingham groups. The nasal limbus was involved twice as often as the temporal limbus. The proportion of the involvement of upper and lower limbus was about equal to five to four.

The distribution of positive and negative cases as to the dietary groups gives definite proof that so-called corneal vascularization has no bearing on dietary habits. In the group of patients receiving proper diet, the proportion of positive and negative cases was 14 to 10. In those in the deficient-diet group this proportion was 11 to 17. Even the distribution of unilateral and bilateral involvement in the positive cases is far from suggesting any relationship between nutrition and limbal vascularity. Among 14 patients with adequate diet, 10 had bilateral and 4 unilateral concentric collaterals. Among 11 patients with poor diet, 5 bilaterally positive cases and 6 unilaterally positive cases were found.

In the group of those having an inadequate diet there were seven patients receiving an extremely poor diet. As an example, William Sh., aged 58 years, should be mentioned. This man could get a glass of milk only once or twice a week; about twice a week he ate an egg; twice a week he had potatoes; sometimes he ate cabbage and beans; fruits rarely, meat once daily. He did not show concentric collaterals, not even the slightest congestion in the limbal meshwork. Three more patients who were on a very poor diet showed no concentric collaterals. Three patients with a diet similar to that of William Sh. had the following distribution:

DISTRIBUTION OF CONGESTION OVER THE LIMBAL QUADRANTS

Name of Patient	Age, years	Right Eye		Left Eye		Quadrants
		Temporal	Nasal	Nasal	Temporal	
Katherine M.	16	3	3	3	0	upper
		0	0	0	0	lower
Dolores H.	10	2	2	0	0	upper
		0	0	0	0	lower
Richard H.	8	0	0	3	0	upper
		0	0	3	0	lower

0 means a few visible limbal loops.
1 means numerous well-filled loops.
2 means incomplete concentric collateral.
3 means complete concentric collateral.

In the cases of those with good diet and highly developed concentric collaterals the objection could be made that, in spite of an adequate intake of vitamins, the failure to utilize them might have produced deficiency. No similar objection is possible with regard to patients on an obviously inadequate diet having limbi free of vascular engorgement.

In one of the Cincinnati cases, Betty Gl., aged 16 years, a combined intrave-

nous and oral riboflavin administration did not induce any change in the considerably filled limbal loops.

Summary

Concentric collaterals are engorged parts of the preëxistent limbal meshwork. Their function is to collect blood from all limbal loops of one entire limbal sector, or a part of them, and to return this blood from the limbus to the larger conjunctival veins.

These vascular anastomoses are optimally visible by retroillumination. They occur in a percentage of 13.3 in a group consisting of persons with manifest or subclinical or suspected vitamin deficiency observed in the Nutrition Clinic in Birmingham, Alabama. Among 69 persons observed in the Eye Clinic in Cincinnati, almost one half had concentric collaterals.

Concentric collaterals should not be mistaken for corneal vascularization. So long as definite pathologic corneal processes are absent, corneal vascularization never takes place, and even very intensive and extensive engorgement does not suffice for trespassing upon the anatomically preformed limbal meshwork. The situation of the concentric collaterals in the cornea proper is only apparent and not real, due to the fact that in the corneal periphery the conjunctivoscleral zone containing these vessels overlaps the corneal rim.

Concentric collaterals, when fully developed, run from the 12- to the 3- or 9-o'clock position, and from the 6- to 3- or 9-o'clock position. As a rule, all concentric collaterals in the upper limbus show a direction of flow downward until they reach the horizontal meridian, and vice versa.

Composed of limbal loops, they usually turn small convex arcs toward the cornea proper; new extensions produce a concave appearance so long as a more central collateral does not develop. Progression always occurs in loops, never in single vessels.

Any kind of long-standing engorgement in conjunctival vessels may induce the formation of concentric collaterals. So far as their developmental mechanics are concerned, they probably are due to a hindrance of venous outflow from the immediately corresponding venous limb, and are to be understood as a kind of collateral circulation leading to the conjunctival veins in the horizontal meridian because of overcrowding in the original venous drainage. This cannot be achieved without dilatation of the particular loops that have to form the new detour. It takes time for this dilatation to develop. It probably is connected with cellular changes, and is not due to a mere stretching of the vessel wall. This fact, on the other hand, interferes with an early reduction of the collateral way, if once formed; the dilatation of these vessels persists after disappearance of the provoking cause.

In a similar way, after engorgement of lower degree or of shorter duration, dilated single loops may be observed around the corneal limbus. They probably are forerunners of concentric collaterals and are as uncharacteristic of vitamin deficiency or of a certain type of vitamin deficiency as are the developed concentric collaterals.

After the formation of one concentric collateral, repeated or prolonged engorgement may produce another concentric collateral, located closer to the corneal center and showing the same direction of flow as did the first collateral.

The occurrence of engorged limbal loops and concentric collaterals in the Birmingham as well as in the Cincinnati patients was more frequent in the female sex and was distributed over all age groups. From these cases no relationship can be deduced between any particular

type of vitamin deficiency and concentric collaterals.

All Birmingham patients gave a history of, or exhibited signs of, repeated conjunctivitis; none of their eyes was free of chronic conjunctivitis. Some of these patients were addicted to the use of alcohol. Pingueculae and hyaline deposits in the bulbar conjunctiva were very frequent in the eyes of these patients, even in young subjects. There seems to be a relation between the most marked conjunctival changes and the location of concentric collaterals.

Among 69 cases selected at random in the Cincinnati Eye Clinic there were 37 patients with congestion in the limbal region, 31 of whom showed typical concentric collaterals. The female sex predominated in the positive group. The percentage of positive eyes was higher in white than in Negro patients. The nasal limbus was involved more often than the temporal limbus, and the upper limbus more often than the lower limbus.

There was no relationship between the dietary habits and the frequency of vascular congestion in the limbal region. The number of positive cases was higher in the good-diet group than in the poor-diet group. Even the number of bilateral cases was higher in the group of well-nourished patients.*

Although in the Birmingham group, consisting of patients with manifest, subclinical, or suspected vitamin deficiency, about one eighth of all cases observed showed concentric collaterals, in the Cincinnati group more than one third of all cases exhibited this sign.

* In recent vitamin advertisements it is frequently suggested that a normal bulbus does not show any blood vessels—pictures of eyes with an entirely white bulbar conjunctiva are reproduced as normal eyes. Such an eye, however, could be only that of a corpse or of a pateint with a very severe anemia. Neither physicians nor the public should be misled into believing that any vascularity visible in the bulbar conjunctiva is necessarily pathologic.

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INTRAOCULAR INJECTION OF SULFANILAMIDE IN A CASE OF PURULENT IRIDOCYCLITIS*

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Injection of sulfa drugs into the anterior chamber of a human eye has, so far as I know, not been attempted previously. It is not the purpose of this short article to advise that this treatment be followed as a frequent procedure. But in special cases one may try it and perhaps achieve as miraculous results as were obtained in the case hereindescribed.

CASE REPORT

Edward S., aged 12 years, was first admitted to the hospital on March 30, 1942, and discharged on May 16th of that year.

Two days before his admission the patient had been struck in the right eye by glass, following an explosion of a bottle of water.

Examination. Vision in the right eye was light perception. There was an irregular central laceration of the cornea. The anterior chamber was formed, a hypopyon in its lower quarter. There was a thick fibrinous exudate extending from the posterior surface of the cornea to the pupillary opening. The pupil was contracted, the iris congested. The fundus could not be seen.

Diagnosis. Laceration of the cornea of the right eye; anterior endophthalmitis. Left eye, normal.

Therapy. Oral administration of sulfathiazole and intravenous injection of typhoid vaccine (3,500,000) together with atropine and adrenalin applied locally and subconjunctivally.

Five days after admission (April 4th) the hypopyon had cleared to a great extent, but the aqueous remained cloudy. No changes occurred in the thick plastic exudate. The pupil was slightly dilated, and there was hyperemia of the iris. There was now no light perception. X-ray studies showed no evidence of a foreign body.

On April 8th the pupil was contracted, the eye congested, and there was beginning vascularization of the cornea. The thick exudate remained unchanged. Light perception was present but light projection was absent except temporally. By April 12th, a large hypopyon had formed in the anterior chamber, filling nearly one half of the chamber. There was no light projection except temporally. The eye was greatly irritated; there was iris bombé, and iris tissue looked atrophic. Enucleation was planned. Chemotherapy had been continued until this time.

On April 14th, a saturated solution of sulfanilamide (0.8 percent) was injected into the anterior chamber, following the removal of about 0.2 c.c. of aqueous. The cloudy aqueous was examined bacteriologically but with negative results. The thick exudate did not move. After the injection the intraocular pressure was elevated, but there was no pain. Two days later the exudate was as before. The injection had been well tolerated. A second injection of sulfanilamide into the anterior chamber was made and an effort to puncture the vitreous in order to study it bacteriologically; but no vitreous could be obtained. It seemed to be of normal consistency.

On April 20th the eye was definitely better. There was less congestion, the aqueous was clearer, and the plastic

*From the Eye Service of the Boston City Hospital.

exudate that had extended from the posterior surface of the cornea to the pupil had disappeared. There were no corneal precipitates in either eye. Iris bombé was becoming more marked, and several areas of iritic atrophy were observed. The pupil was contracted and fixed; there was no hypertension of the eye.

On April 28th there was less congestion and irritation. An iridectomy was performed.

May 2d. Following the iridectomy there was marked hemorrhage into the anterior chamber. The tension was normal. Five days later the hyphema had become absorbed; there was return of light perception. The eye was white, and quiet. Under slitlamp observation, no cells were seen in the anterior chamber.

On May 12th the condition of the eye was good, and the patient was discharged to the Out-Patient Department on May 16th.

The patient was admitted a second time to the hospital on August 17, 1942, and discharged on August 22d. The right eye was quiet. There was an old scar in the cornea, with anterior synechia. The iris was partly atrophied. Vision did not suffice to detect hand movements. There was good projection. Vision in the left eye was 20/30 with a −3.00D. sphere.

On August 18th a second iridectomy was performed, and there was no inflammatory reaction. Four days later a cataractous lens was visible.

On the patient's third admission to the hospital, January 11, 1943, it was decided to operate. On the following day a discision was made with deWecker scissors, and the small anterior synechia was freed. Convalescence was normal, and the patient was discharged on January 16, 1943.

On February 10, 1943, a clear hole was observed in the coloboma. With a correction of +12.00D. sph. ⊂⊃ +3.00D. cyl. ax. 70° vision was 20/40.

Comment

There seemed to be no question that the eye of this 12-year-old boy, who had received a perforating injury of the cornea by glass on March 28, 1942, was lost. The inflammation, the photophobia, the exudate in the anterior chamber increased daily, and there was only a slight light perception (even this was not sure). General treatment with sulfathiazole tablets, as well as with typhoid-vaccine injections, had apparently no beneficial effect. Enucleation was planned.

Could one expect anything from the local use of sulfa drugs? The usual method of local application in the eye (instillation, subconjunctival injection, powder in the cul-de-sac) was not promising in a case of purulent iridocyclitis. The only way to bring a high percentage of sulfanilamide to the diseased part of the eye seemed to be a direct injection of a saturated solution into the anterior chamber. V. C. Rambo[1] (1938) had shown in rabbits that there was no or only a very slight reaction even when a suspension of sulfanilamide powder in cold water (100 mg. to 1. c.c.) was brought into the anterior chamber. K. Heinz[2] (1938) found that prontosil was tolerated in the anterior chamber of rabbits without any irritation. Thus in such a lost case there was no risk in trying injections into the chamber, which I had performed many times with other drugs, especially in experimental work.

Whereas sulfanilamide is very soluble at high temperatures (47 gm. in 100 c.c. water or normal salt solution at 100° Celsius), the solubility is only 0.8 gm. percent at body temperature (Guyton,[3] 1941). This solution is probably the most suitable one for injection.

For those who are not familiar with anterior-chamber injections, the procedure may be briefly described: An empty 1-c.c. syringe, which is provided with a short, well-sharpened needle, is intro-

duced near the limbus. The end of the needle should always be between the iris and cornea and never in the pupillary area. Therefore it is advisable to put in the needle at about the 3-o'clock position with the direction toward 6 o'clock. When one is sure that the needle is free in the chamber, as much as possible of aqueous fluid is aspirated (generally 0.2 c.c.). Then, while the needle stays in the chamber, the fluid from the syringe is removed, the syringe is filled with the sulfanilamide solution, connected with the needle and 0.2 c.c. or a little more of this solution is injected. Syringe and needle should then be removed quickly. The finer the needle, the smaller will be the hole through which fluid can escape from the chamber.

The two injections were tolerated very well. The exudate shrank and disappeared. A few days after the second injection, irritation and inflammation of the eye decreased definitely. Ten days later an iridectomy could be performed because of the iris bombé. In the following months the eye was always quiet, but the coloboma narrowed, so that another iridectomy was performed in August, 1942, and eventually a discission of the membranous cataract (in consequence of the perforating injury).

The vision improved more and more and was, at the last examination in February, 1943, 20/40!

From a critical point of view I assume that the inflammation (and infection) in our case was not very severe, because the puncture of the vitreous and the whole course showed that the inflammation was restricted to the anterior part of the eye. But clinically one did not know that and it was absolutely justified, even necessary, to plan an enucleation.

It may be that sodium sulfathiazole iontophoresis (Boyd,[4] 1942) is also very valuable in infections of the anterior globe.

Summary

In a case of purulent iridocyclitis traumatica enucleation was planned because of great irritation and absence of light sensitivity. Following injection of sulfanilamide into the anterior chamber inflammation disappeared and final vision was 20/40.

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A COMBINED PTOSIS OPERATION*

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The operation presented for your consideration is a combined procedure for the correction of ptosis. The method is based chiefly on the Motais[1] operation—the utilization of a strip of the superior-rectus tendon, when that muscle has a normal action.

In the procedure, the skin is incised with a scalpel at about the level of the upper border of the tarsus. Blunt scissors are introduced into the wound, and, by blunt dissection, the conjunctival surface is reached (fig. 1).

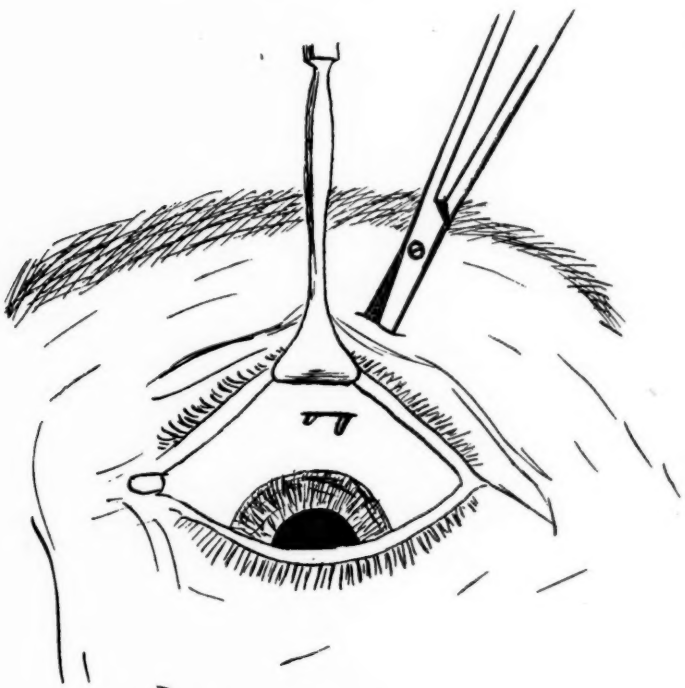

Fig. 1 (Ellis). Incision and blunt dissection.

The upper lid is retracted, and the conjunctiva is opened over the superior-rectus tendon. A lid speculum is now put in place. Through the opening in the conjunctiva the superior-rectus tendon is exposed. With the use of a muscle splitter, the tendon is divided into three equal parts, and is split as far back as possible. As much as half of the tendon of the superior-rectus muscle may be used without endangering its function.[2] A double, double-armed black-silk suture (Deknatel "D") is now put into the middle section of the tendon; for this the Wiener cinch stitch is used (fig. 2).

The needle is introduced into the muscle tendon at about its middle, and two millimeters from the insertion. The needle is carried parallel to the line of insertion and within the tendon to the lateral border of the tendon strip. A whip stitch is

* Read before the Pacific Coast Oto-Ophthalmological Society, May 13, 1942.

put in by introducing the same needle through the full thickness of the tendon just behind the previous suture and catching only a few lateral fibers. A similar stitch is put into the other half of the muscle tendon with the same suture. The middle third of the superior-rectus tendon is now shaved off the eyeball at its insertion with a scalpel. O'Connor[3] of San Francisco uses a double suture, splits the tendon slip into three portions, and puts in his cinch stitch.

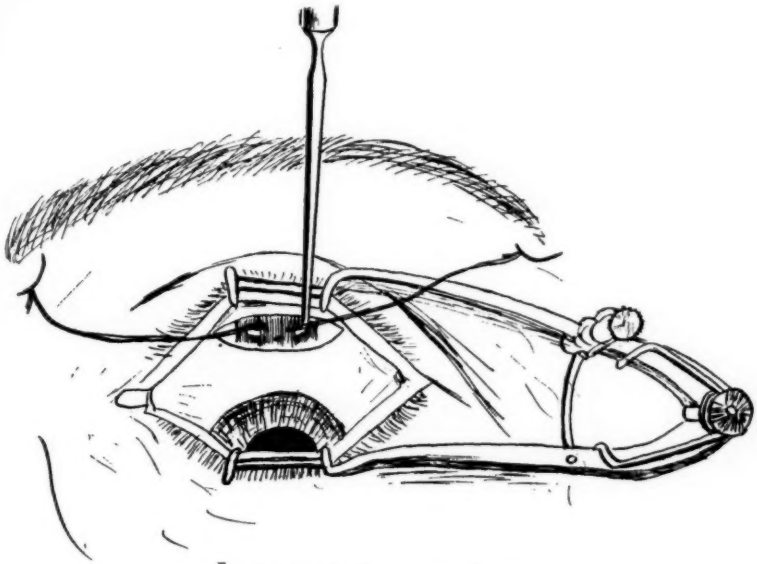

Fig. 2 (Ellis). Insertion of suture.

A narrow curved strip of metal, with two small holes in it, is introduced through the skin incision, and emerges in the opening in the conjunctiva. The sutures are passed through the holes in the metal strip, the lateral ones through the lateral hole and the medial ones through the medial hole, so that the tendon will not be rotated as it is pulled through (fig. 3).

The needles are cut off the sutures, and the sutures and the tendon are pulled through the metal strip to the skin opening. The skin edges are now retracted, and the central portion of the anterior surface of the tarsus is cleaned almost to the free border of the lid. The four ends of the double suture are rethreaded separately, on small curved needles. These needles are passed into the skin opening and over the cleared tarsus. One from each side emerges through the skin just above the lashes and about five millimeters on each side of the midline. The next two are similarly placed except that they come out one millimeter above the first pair (fig. 4).

These sutures are tied over a small piece of rubber, and the amount of correction desired is attained by adjusting the pull on the suture. This procedure, also taken from O'Connor's work, sutures the muscle in a flattened position, thus allowing a firmer and broader attachment, and therefore assuring a greater chance of success.

The skin incision is closed with interrupted black-silk sutures, and the conjunctiva with a continuous silk suture.

A Pagenstecher[4] stitch is put into the lateral and medial portions of the lid, derma suture being employed, with each

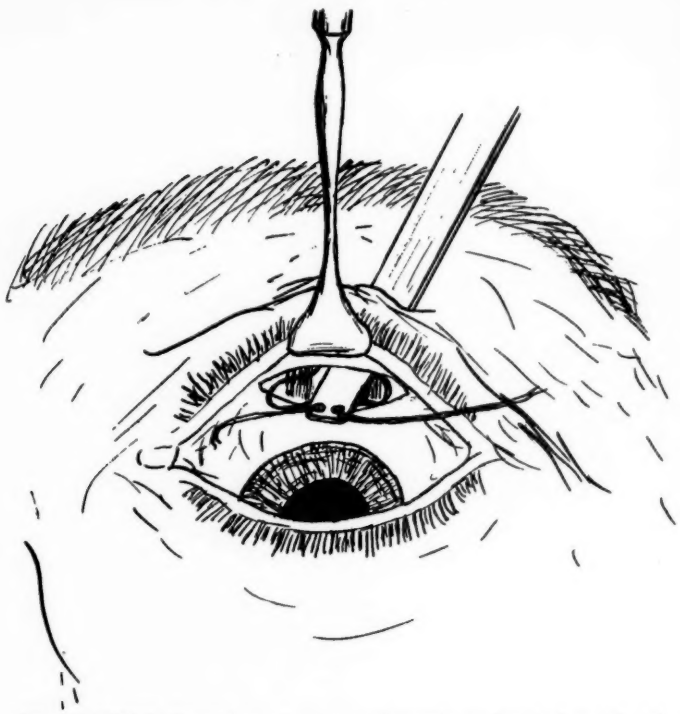

Fig. 3 (Ellis). Insertion of sutures through perforated metal strip.

end threaded on a large cutting needle (fig. 5).

The needle enters the skin laterally just above the lid margin, and is passed subcutaneously to emerge in the brow. The course of the suture increasingly diverges from the midline. The other needle passes parallel to the first, and 3 to 4 mm. from it. The suture is passed through a small piece of rubber, and a friction knot is

Fig. 4 (Ellis). Sutures passed into skin opening.

tied. Another suture is similarly passed medially and tied over rubber. The eye may be closed by a Buller shield, or by pulling up the cheek and using an eye pad, as is preferred.

The practice of combining operations for ptosis is not new, and Wood[5] in 1911 suggested that the Motais operation might be combined with one of the deep-suture operations for supporting the lid. Such a procedure was reported by Webb Weeks,[6] who combined it with a Motais operation and used a levator sling for the support of the superior-rectus muscle, after the method of Eversbusch.[5] In 1934 Frost[7] devised a supporting suture —a mattress stitch of both the upper and lower lids—to be used with a ptosis operation.

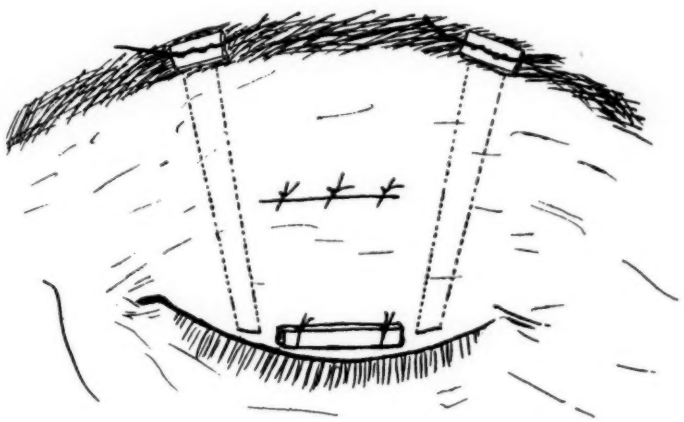

Fig. 5 (Ellis). Closure of incision, and placing of final sutures.

The use of the Pagenstecher suture in the procedure reported here accomplishes two purposes: (1) It acts as a traction or stay suture, allowing the strip of superior-rectus tendon to heal in the desired position without tension. (2) It assists in the elevation of the lid, and thereby lessens the strain on the superior-rectus muscle. At the same time it aids in avoiding the central peaked effect often following this type of operation. This undesirable result has not been present following the operations performed by the author.

In my opinion, not enough attention has been paid to the excellent modifications of the Motais operation by O'Connor, and many of the procedures contained in this paper are taken from his work.

Summary

A combined operation for the correction of ptosis has been presented. This method utilizes a strip of the superior-rectus tendon which is allowed to heal in the desired position in the upper lid due to placement of Pagenstecher sutures. The procedure is based on firm surgical principles, and is indicated in cases of ptosis with good action of the superior-rectus muscle. In the literature the Motais procedure is the operation generally preferred, but no operation is applicable to all cases. The Motais operation is not technically difficult, and the additional procedure—the placement of the Pagenstecher sutures—does not lengthen the time of operation by more than a few minutes. Utilization of this procedure has brought gratifying results, and the operation is more likely to be successful than are most of the others, which also are harder to perform. *727 West Seventh Street.*

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Discussion

Dr. Wilford H. Belknap (Portland, Oregon): I should like to compliment Dr. Ellis for presenting such an interesting paper; this modification of the Motais operation simplifies the procedure and it seems to me improves the operation. Ptosis is quite a problem. It is a deformity definitely disfiguring and should be corrected as early as possible.

Drooping of the lids or ptosis is either congenital or acquired; when a congenital malformation, it is due to improper development of the levator palpebrae muscle, or possibly the muscle is entirely absent. Acquired ptosis is due to paralysis or paresis of this muscle.

Cases requiring surgical intervention are usually congenital and also bilateral.

The muscles actively involved in elevation of the lids are three; in the order of their importance, the levator palpebrae, the frontalis, and superior rectus.

The levator, due to its insertion, draws on all structures of the lid at the same time and it is therefore the perfect elevator. The frontalis is less direct; its contraction raises the eyebrow, skin of the region is made tense, and in this way indirectly assists in opening the lid; very imperfectly to be sure. The superior rectus has even less direct action than the frontalis, its function as an elevator is due solely to a fascial band running from the superior rectus to the levator. Dr. Ellis uses the middle portion of the superior-rectus tendon.

A few years ago, about 1936, Dr. C. Allen Dickey of San Francisco presented a paper before this Society describing his operation for ptosis. Dr. Dickey uses a fascia sling and utilizes the entire tendon of the superior rectus.

Dr. Trainor of Los Angeles has also described his operation, which consists of passing a portion of the tarsus underneath the entire tendon of the superior rectus: this is a very simple operation.

We must not lose sight of the fact that when we utilize the superior rectus in any operation of the lid, we bring about a mechanical connection between the eyeball and the lid which does not physiologically exist, and for this reason it seems to me that if the condition can be relieved by an operation on the lid only, such as the Blaskovics operation, this is probably a better procedure.

Dr. Frederick C. Cordes (San Francisco): First of all, I want to congratulate Dr. Ellis. I think his movie is by far the best method of showing any new surgical procedure. There is no confusion at all and every step can be followed carefully and accurately.

As Dr. Belknap has pointed out, there is no one operation that applies in every case of ptosis and each case must be studied very carefully. Dr. Ellis's opera-

tion is primarily a modification of the Motais operation. Motais uses the central third of the superior rectus to pull up the lid; as Dr. Ellis pointed out, this causes tenting of the upper lid and with the modification he has made, I am sure that to a great extent it does away with this objection.

We have been using Dr. Dickey's operation at the University of California since he originally devised it, and we prefer it for several reasons: first of all, it is not difficult to do; second, you do not detach the muscle or any portion of it and, rather than rely upon a central third to do all the work, the latter is distributed over the entire muscle and, consequently, it would seem there should be less danger of fatigue.

Also, there is the advantage of being able to adjust it to any given position because of the fact that you use this sling behind the muscle. In addition, in those cases where an eye has been operated on and there has been a failure, it can be used without difficulty. One patient on whom I operated had had complete closure of the lid and had been operated on twice unsuccessfully. With this operation we were able to correct the defect.

We must keep in mind, however, that from any operative procedure to replace the function of a paralyzed muscle, we must not expect a perfect physiological result; there is no such thing as a perfect substitute for a paralyzed muscle.

In closing, I feel that Dr. Ellis's operation does away with some of the objections which have been made to the Motais operation.

Dr. Ellis. I wish to thank the discussers, Dr. Belknap and Dr. Cordes. In reply to Dr. Dickey's question, I operated on one boy three-and-a-half years old. First I did, as I have been doing, this Motais operation without the use of the additional Pagenstecher suture; this corrected the ptosis by about half. I then operated on the other eye with this combined procedure and it was successful. The first eye needed about 1.5 to 2 mm., and the superior-rectus tendon was isolated and tucked. That pulled it up also about half way. The Blaskovics operation was then used and a full correction was obtained. The operations that I have performed using the combined procedure have been successful and no repetition has been necessary thus far—the superior-rectus tendon has never slipped.

PROCEDURES AND APPLIANCES THAT ARE HELPFUL IN TREATING INDUSTRIAL OCULAR INJURIES*

WILLIAM B. CLARK, M.D.
New Orleans

The following methods and appliances have been used by me for several years in treating industrial ocular injuries. Some are not original with me, others are.

1. *The Mueller shields.* The original Mueller shields were made of porcelain, and the first set that I saw was purchased

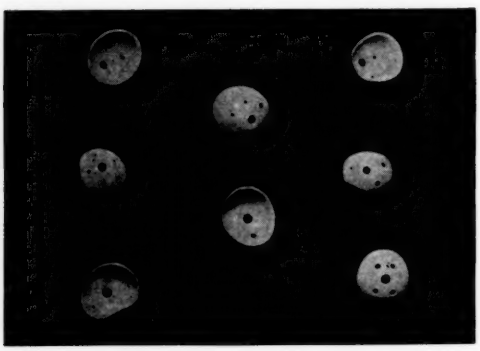

Fig. 1 (Clark). Eye shields.

in Vienna, in 1928, by Dr. Henry Blum, of New Orleans. As far as I have been able to ascertain, no reference to their use has been made in recent ophthalmologic literature, and since I have found them to be so helpful in the treatment of burns of the eye, both chemical and thermal, I feel that their use should be more widespread.

The shields that are demonstrated herein are made from a plastic and are obtainable from a firm in Chicago that makes artificial eyes. They are so constructed that when inserted in the eye they rest upon the bulbar conjunctiva in the upper and lower fornix, forming a shallow cone over the cornea. This is accomplished by having the shield's radius of curvature slightly less than that of the eyeball. The advantages in the treatment of burns of the eye with these shields are: 1. They separate the bulbar and palpebral conjunctiva and prevent the formation of adhesions of symblepharon. 2. They protect the damaged cornea from the conjunctival surface of the lids, which is also usually damaged in chemical burns of the eye. 3. They not only prevent, but, in my experience, have corrected cicatricial ectropia that have followed burns of the lids.

Mueller shields are used in the following manner. As soon as the burned patient comes under observation, the eyes are anesthetized with pontocaine, and the conjunctival sac and the cornea are thoroughly cleansed. Then the concave portion of the shield is filled with ophthalmic ointments, usually a mixture of holocain and adrenalin and atropine ointment, or scopolamine ointment, as the individual case may demand. The shield is then inserted in the same manner as an artificial eye is placed in a socket. The eye can then be irrigated at any desired interval, with normal saline solution or the solution of choice, without removal of the shield. This is done by placing a dropper filled with the solution over one of the holes in the shield, and with gentle pressure forcing it through the shield. As the solution comes out through the other holes and around the edges of the shield, the mucus and debris are washed out. If more ointment is needed it can be applied by inserting the tip of an ophthalmic tube into one of the small holes in the shield which is small enough to prevent the tip of the tube from coming in contact with the cornea as the ointment is forced in behind the shield. The shields should be removed

* From Department of Ophthalmology, Tulane University School of Medicine. Read before Birmingham, Alabama, Eye, Ear, Nose, and Throat Society, February 9, 1943.

and cleansed daily, then reinserted until the cornea is healed. In the case of eyes that have not been treated by this method in the early stages, symblepharon may already be present. A small shield is therefore inserted at first and its size gradually increased, at intervals of a few days so that the bands of adhesion in the upper and lower fornices can be stretched until their normal size is reëstablished.

2. *Debridement of the corneal epithelium in superficial abrasions of the cornea that do not heal within 24 hours.* Many ophthalmologists have been impressed by the fact that the corneal epithelium may be abraded from most of the corneal surface one day and find it entirely reepithelized the next. The upper lids of a few individuals are so constructed that they seem to form a suction between the globe and the lid. If the cornea of such an individual receives an abrasion it fails to heal normally, so that for several days the abrasion remains at its original size, causing intense pain and secondary iritis. I have found that if these eyes are studied with the corneal microscope the epithelium surrounding the abrasion will be observed to be loose and to have very much the appearance of a ruptured blister, or bullus, as in bullous keratitis. If let alone this type of injury heals slowly, the eye sometimes requiring weeks to recover. It is frequently complicated by infection and secondary corneal ulcers. Such corneal abrasions may follow the removal of a foreign body; accidental trauma of the cornea, such as a scratch with the corner of a piece of paper, a leaf or twig from a flower or plant; or may be the result of the scratch of the eye with a baby's small but sharp fingernails. Most of the cases of this type are seen 24 hours or longer after injury. When an abrasion has not healed after this length of time I have found the following treatment most successful.

First the eye is anesthetized thoroughly by five instillations of a 1-percent solution of pontocaine at five-minute intervals; then a 1:1,000 adrenalin solution is instilled with the last two drops of the anesthetic. Using a speculum to hold the lids apart, I roll back the loose corneal epithelium from the abrasion with a tightly wound cotton applicator. At times it is surprising to observe how much of the corneal epithelium has been loosened by the suction of the lid. In many cases there will remain only a small rim of normal epithelium around the limbus, but there is no need to stop the debridement until all the loose epithelium has been removed; it will not reattach itself to Bowman's membrane. Following this the edge of the epithelium is cauterized with phenol or with a 50-percent solution of trichloracetic acid, applied with a pointed applicator. If the original abraded area of the cornea appears to be infiltrated or infected, this area is also cauterized with the acid. The speculum is removed and 1-percent atropine ointment and 5-percent sulfathiazole ointment are instilled into the eye. Then the upper lid is elevated by grasping the lashes between the forefinger and thumb and brought down over the cornea. Both eyes are tightly bandaged and the patient is put to bed. The pain is controlled by opiates, and the patient's anxiety and fear, which accompany the bandaging of both eyes, may be controlled by using phenobarbital or bromides. Since it is difficult to have a patient cared for at home with both eyes bandaged, I prefer to treat this type of case in the hospital.

A few words about bandaged eyes. I have come to the conclusion that a bandage applied to an eye (whether, over one or both eyes) that does not hold the upper lid firmly in place so that the patient cannot blink the eye under the bandage, is useless; in fact, it is worse than no bandage at all. A loose bandage that

allows the patient to blink his eye beneath it only increases the irritation of the cornea because the lid is held more firmly than normal against it by the bandage as he blinks.

3. *A simple method that helps distinguish between acute congestive glaucoma and acute secondary glaucoma.* Probably few of us have not had patients who complained of a red and painful eye, following a trivial injury, and who on examination were found to have an eye with markedly increased tension and a cornea so steamy that it was impossible to get a beam of the slitlamp to pass with sufficient intensity to make it possible to tell if there were secondary glaucoma or not. I have found that the use of 10-percent sodium-chloride solution, in the following manner, will in many cases clear up the corneal edema.

Since sodium chloride in 10-percent solution is quite painful when instilled into the conjunctival sac, the eye should first be anesthetized; then the instillations of the sodium-chloride solution are begun, two or three drops at five-minute intervals, for five or six times. The hypertonic saline solution will sufficiently draw the water from the edematous cornea so that the beam of the slitlamp will pass through the cornea and a differential diagnosis can be made. If the cornea has not cleared by the end of that time, this procedure is of no use.

I have found that to be able to distinguish between the two types of glaucoma is of great value, for the treatment of the two is entirely different. Acute congestive glaucoma is treated with miotics, and acute secondary glaucoma due to uveitis is treated with atropine and dionin and foreign-protein therapy.

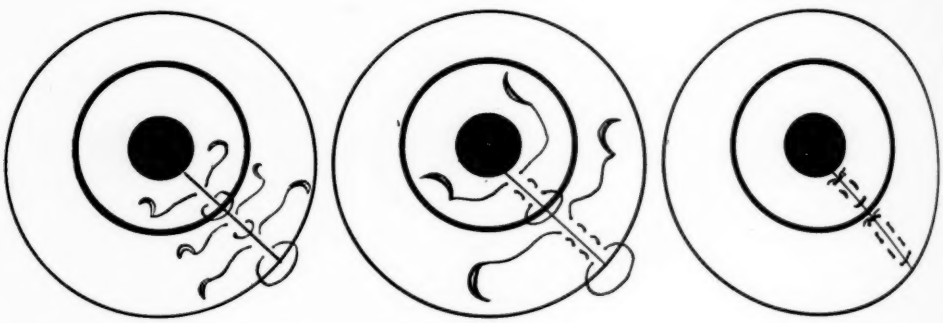

Fig. 2 (Clark). Sutures for corneal and scleral wounds.

4. *A suture for closing corneal and scleral lacerations.* It is difficult to suture a lacerated wound of the cornea or sclera by placing interrupted sutures, for the sutures should not transfix the full thickness of the cornea or the sclera. If they do they leave an avenue for infection to enter the globe from without. But it is nearly impossible to place a suture into the lips of such a wound at the correct depth, for if the suture is put through one lip properly, then getting the suture through the opposing lip so that the wound's edges are approximated correctly is all but impossible. Frequently the pressure exerted in attempting such a closure means loss of vitreous, or more iris prolapse, or both.

This difficulty can be eliminated in part by placing corresponding sutures parallel to the wound on each side and tying the two ends across. This is accomplished in the following manner. A double-armed suture of 6-0 black silk on an atraumatic

needle is used. The suture is inserted first on one side of the wound and then on the other, always with the point of the needle in sight when suturing the sclera, so as not to perforate. The point of entrance and exit, and the line of the sutures, on each side of the wound should correspond in order to prevent gaping of the wound when the suture is tied. After the sutures have been inserted, the loose ends are drawn down and tied across the wound, not too tightly, but with just enough pressure to approximate the edges of the wound. One or more sutures may be used, depending on the length of the laceration.

The sutures are left in place from 5 to 10 days, depending on the length and severity of the laceration, and they may be removed simply by cutting the untied end of the suture with sharp scissors or the point of a cataract knife, then grasping the knotted end with a fine pair of serrated forceps and pulling it out.

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IMPROVED TECHNIQUE FOR IMPLANTATION OF A BALL IN TENON'S CAPSULE

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Boston, Massachusetts

Over simple enucleation, implantation of a ball in the orbit provides two undisputed advantages of which no patient should be unnecessarily deprived. These are, prevention of unsightly sinking in of the upper lid, and increased range in the motion of the artificial eye. Mules,[1] in 1885, was the first to employ such a procedure. He enclosed a glass ball in the cavity left after evisceration of the eye. His operation yielded excellent cosmetic results, but since it retains the same objectionable features as simple evisceration, many operators, including myself, regard it and its subsequent modifications as unjustifiable. It is believed not only not to eliminate existing danger of sympathetic uveitis, but to introduce this danger when it does not already exist,[2] and it prevents microscopic examinations that might be of value to the patient and to science. Possibly some or all of the cases reported as sympathetic uveitis after Mules's operation were not really such, or would have occurred after complete enucleation, but it is certain that more or less uveal tissue remains in the sclera after evisceration. The advantages of Mules's operation are not sufficient for me to be willing to expose a patient to even the slightest risk of sympathetic uveitis in order to gain them.

Enclosure of the ball in Tenon's capsule was proposed by Frost in 1886 (Middlemore Prize Essay). Lang[3] in 1887 reported the use of a similar procedure in 16 cases. He did not suture the muscles over the ball but united Tenon's capsule "horizontally by three fine silk sutures." In two cases he used catgut sutures, and these were the only cases in which the ball was extruded. He used a glass ball, but suggested that a celluloid ball might serve. In discussing Lang's paper, Frost stated that in only one of his own six cases was the operation completely successful. In one case the ball was retained but became displaced, and in four cases it became exposed and was removed. He attributed his poor results to

the facts that he sutured the muscles over the ball and employed catgut.

Instead of a glass ball, a gold ball, fat, bone, cartilage, and other substances have been used in Frost's operation. Fat is unsatisfactory because it always undergoes more or less absorption. I have found a glass ball so satisfactory that I have not experimented with other substances. Except for the cost, there seems to be no objection to a gold ball, and it obviates the remote danger of breakage. However, the glass ball has never broken in any of my own cases. It is still only an assumption that any of the other implants that have been recommended, including plastics, will stand the test of time as have glass and gold balls.

Perhaps unaware of Frost's poor results, and undeterred by their own, many operators have continued to suture the muscles over the ball in the belief that this procedure reduced the danger of extrusion and increased the mobility of the artificial eye. Observing many cases, and hearing of many others in which after this procedure the ball became displaced outside the muscle cone, I long ago concluded that the tightened muscles tended to force out the ball between them. Moreover, motion of the artificial eye is directly dependent not upon motion of the ball, but upon retraction of the conjunctival sulcus by the muscle that moves the ball. It seemed to me that this retraction would be greater if the muscles were not sutured over the ball, provided they did not slip too far back. I devised a new method of suturing Tenon's capsule, so as to provide a firm covering for the ball without suturing the muscles. Designated by my name, this method was published in 1919 by Howard.[4] Since then it has been routinely used by the staff of the Massachusetts Eye and Ear Infirmary. Periodically there are new internes here who try including the muscle tendons in the single suture, but who, later, finding that this is disadvantageous, cease doing so. Apparently the method has not been commonly used elsewhere, no doubt because its advantages have not been widely emphasized.

For holding the ball in place, I used only one suture, not merely for the sake of simplicity, but because I believed it to be more effective and safer than multiple sutures. Wherever a suture is inserted it tends to cause necrosis and thus provide an exit for the ball. The tighter the suture and the less the amount of tissue it includes, the greater this tendency. Hence a single suture which includes a considerable amount of tissue and is not tied too tightly, is preferable to multiple sutures each of which includes only a small amount of tissue. Originally, owing to fear of infection from the catgut then available, I employed a silk suture which was carried through the conjunctiva, tied over a button, and subsequently removed. For some years now I have used, instead, a catgut suture (#000 chromic catgut) covered by the conjunctiva. This did away with the annoyance of removing the suture, and proved to be safe—the ball has not been extruded in any of my cases. I have also modified the operation in a few minor details, and have added a procedure that I believe to be of considerable value; namely, the introduction of a form into the conjunctival sac at the completion of the operation. A brief description of the operation as I now perform it follows:

The conjunctiva is severed close to the corneal limbus, and then, with all the underlying tissue down to the sclera, is carefully dissected from the globe—at this stage the conjunctiva is not dissected from Tenon's capsule. After the eye has been removed, the socket is kept packed with gauze until hemorrhage has practically ceased. Then the glass ball is in-

serted and pushed back into the orbit. With a broad fixation forceps, Tenon's capsule is grasped near the cut end of the external rectus tendon, and a tongue, consisting of two layers of the capsule, is pulled forward. About 5 mm. behind the end of this tongue the two needles of a doubly armed catgut suture are passed through the tongue from beneath, about 6 mm. vertically apart. The two needles are then passed from beneath through a similar tongue in front of the internal rectus tendon. Then they are passed from beneath through a tongue in front of the superior rectus muscle, not side by side, but one in front of the other, the upper about 7 mm., the other about 3 mm. back. The needles are then passed through a tongue in front of the inferior rectus tendon, the lower needle the farther back. The ends of the suture are now pulled upon until all four tongues are brought into a pile in front of the ball. The suture is then tied securely and cut close to the knot. The loop of suture should firmly, yet not severely, compress the tissue it encloses. If, as is exceptionally the case, the conjunctiva does not lie smoothly, or is under undue tension in places, it is now suitably dissected from the underlying Tenon's capsule. If, as is usual, the conjunctiva comes easily together, the conjunctival opening is horizontally closed by a continuous silk suture, and the catgut suture thus buried. Otherwise, interrupted sutures are used for uniting the conjunctiva. The conjunctival sac is filled with 5-percent sulphathiazol ointment, a form of suitable size placed within it, and a pressure bandage applied over the closed lids. The form should not be so large as to prevent easy closure of the lids.

The bandage and the form are removed at the end of three days, and the socket inspected. If the reaction is slight, as it usually is, and postoperative hemorrhage is not feared, a light bandage is applied to absorb the secretion, and the patient allowed to go home. If there is considerable chemosis, the form is reinserted, the pressure bandage re-applied, and both allowed to remain until the edema has considerably subsided. The conjunctival suture is removed at the end of a week.

As a rule the patient begins to wear an artificial eye two weeks after the operation. At first he is provided with a "stock eye" of approximately the correct size and color. About six weeks later, if he so desires, he has a prosthesis made especially for him. Generally, the eye maker wishes to make the final eye before the socket has become thoroughly established.

It is to be noted that the suture in Tenon's capsule does not act as a purse string. A purse-string suture leaves a weak spot in front of the anterior pole of the ball, just where the ball tends to become extruded. Moreover this is the place that must bear the brunt of the pressure of the artificial eye. The single suture inserted as I have described brings together in front of the ball four overlapping tongues consisting of eight closely applied layers of Tenon's capsule. The muscle tendons are pulled forward by the capsule so that their cut ends reach a point somewhat anterior to the equator of the ball.

As to the shape of the ball, I believe that it should be as nearly spherical as possible—an aspherical or grooved ball would be more likely to be extruded and would tend to undergo undesirable rotational displacement. As to the size of the ball, a compromise must be made between the mobility and the prominence of the artificial eye to be worn. Within certain limits the larger the ball the greater this mobility, but if the ball is too large a shell eye may be necessary and even this may be too prominent. The makers of

artificial eyes prefer the ball to be too small rather than too large. I am partly influenced, as to the size, by the tendency of the ball to come out before the suture is tied. For adults, I usually select a ball 18 mm. in diameter.

The purposes of placing a form in the conjunctival sac at the end of the operation are to press the conjunctiva into the proper position, and to combat the edema which otherwise might cause the conjunctiva to project between the lids. I have used this procedure for many years, and it is now in common use by the Infirmary staff. Until lately I have used reform artificial eyes, although these were not so suitable as could be desired. Those available to me, when otherwise sufficiently small, were too narrow horizontally to afford adequate protection against excessive edema at the inner and outer canthi. They were also too deeply concave. Recently I have carved out wooden forms which for the purpose at hand, have proved to be more suitable in size and shape. Sterilized in 95-percent alcohol and then coated with ointment I have found them to be nonirritating during the short time they remained in the sacs. Similar forms made of glass or plastic would, of course, be preferable.*

Except in cases of children and in cases of severe infection I always employ local anesthesia for the operation. In my opinion, except in such cases, the risks of general anesthesia are unwarranted. Most operators inject the orbit through the conjunctiva. Years ago it occurred to me that it would be safe to employ local anesthesia in cases of relatively mild intraocular infection, provided the needle was passed through the lids. I did this in such a case, and the result was so satisfactory that I have since almost invariably made the injections through the lids even in the absence of infection. Quickly passing the needle through the lid causes remarkably slight pain. I employ the usual solution—procaine 2 percent with epinephrine 1:50,000. Two cubic centimeters are injected deeply into the orbit through the upper lid near the inner canthus, and the same amount near the outer canthus. Then at the midline, 1 c.c. is deeply injected just below the upper orbital margin, and 1 c.c. just above the lower orbital margin. The last injection I have found to be very important, for without it dissection below the globe is always painful. In spite of the large amount of anesthetic injected, I have never seen it produce any serious systemic effects even when there was high blood pressure. This may be because the eye is so promptly removed that absorption is minimized. I use no preoperative medication, but prescribe codeine or morphine after the operation, if the patient then complains of pain.

In a few of my cases there was excessive postoperative edema, presumably due to hypersensitiveness to procaine. This, of course, prolonged the convalescence. In two of my cases there occurred, on about the third day after operation, intraorbital hemorrhage so forcible as greatly to distend the orbital tissue. Surprisingly enough, in neither case was the glass ball extruded. In the first case I removed the ball, but I now feel sure that this was unnecessary. In the other case the hemorrhage was more severe, causing the orbital tissue and edematous conjunctiva to protrude between the stretched eyelids like a large tumor mass. It also distended the lymphatics of the

*I have had the wooden forms copied in plastic, in three sizes, by a dental technician, S. S. VanAtten, 363 Marlborough Street, Boston, Massachusetts. The plastic forms will not withstand sterilization in alcohol, but are not harmed by 10-percent formalin. Five minutes' immersion in 95-percent alcohol produced innumerable cracks in their surfaces. Owing to war conditions I have been unable to have the forms copied in glass.

face as far as the preauricular gland, and engorged with blood the conjunctival lymphatics of the other eye. Two and one-half months were required for the mass to shrink sufficiently to permit the wearing of an artificial eye, and seven months before the cosmetic result was finally satisfactory. The fact that neither excessive intraorbital edema nor hemorrhage caused extrusion of the ball in any of my cases, demonstrated the security of the method of suturing. In my opinion the hemorrhages occurred not on account of, but in spite of the ball implantations.

Except in cases of severe infection, I implant a glass ball after every enucleation, even including those for intraocular tumor. In cases of malignant melanoma of the choroid, ball implantation provides an additional advantage exemplified by the following case: The eye had been removed and a glass ball implanted by a colleague who had then sent the eye to me for microscopic examination. I found the eye about one-third filled with an unpigmented spindle-cell malignant melanoma which had perforated the sclera at one side of the optic nerve and had been cut through in the removal of the eye. I explained the conditions to the patient and he refused evisceration of the orbit, but permitted an attempt to excise the remaining orbital growth. When I removed the ball two weeks after its implantation, it left a well-defined cavity at the bottom of which the region of the extraocular growth was easily determined by its relation to the optic nerve. Microscopic examination of the tissue which I excised from this region showed it completely to include a tumor mass similar to that in the eye, and 8 cm. in diameter. The socket was given X-ray treatment on the day of the operation and twice afterwards. When I last saw the patient, 15 years later, he was in good health, was wearing an artificial eye, and showed no local recurrence. Of course, in the case of a highly malignant tumor the risks of local recurrence and of metastases would be greater, yet no doubt most patients would prefer to submit to them rather than to undergo the horrible mutilation of an exenteration. In another case of the kind I should reimplant the glass ball, and omit X-ray treatment, for, from what is now known, it is certain that this treatment had nothing to do with the successful outcome.

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NONSURGICAL ASPECT OF OCULAR WAR INJURIES*

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The discussion of this subject is based on knowledge gained during the First World War, civil practice, and the reports from abroad based on experiences in Poland, Barcelona, Dunkirk, Coventry, London, and the front lines.

Shimkin,[1] who in the last war was an ophthalmic surgeon at the chief casualty clearing station on the Russian front, and who was later at a base hospital, states that in that war 2.25 percent of all wounded sustained ocular injuries. Loewenstein,[2] from knowledge based on front-line experiences in the present war, found that 12 percent of all injuries were to the eye. With increased naval warfare and the possible use of gas the percentage is expected to rise to 15-17. This is a high value when one remembers that the eye comprises only 1/300 of the body surface. Often the ocular injury is only one of many and is at first overlooked.

There are certain basic causative agents that produce eye injuries in warfare.

(1) *Artillery fire.* This, according to Loewenstein,[2] is one of the most important causes of ocular wounds, especially when the surroundings are stone buildings, cement, or like materials.

(2) *High-explosive bombs.* Ballantyne,[3] as a result of his experiences in English air raids and 250 Barcelona air raids, found that these bombs were the most common cause of eye injury. High-explosive bombs when falling in cities devastate wide areas and scatter rock, sand, brick, concrete, glass, and other materials in all directions. These particles may enter the eye.

(3) *Incendiaries.* These are not apt to be dangerous unless water is thrown on them, when they scatter burning fragments.

(4) *Flame burns,* as seen in oven, furnace, or gasoline explosions, may cause scorching.

(5) *Contact burns* may occur from molten metal, burning wood, and the like.

(6) *War-gas burns.* These are caused chiefly by the vesicant gases, such as mustard or Lewisite.

Certain basic principles underlie the treatment of ocular war injuries. Exclusive of gas injuries, Loewenstein,[2] Ballantyne,[3] and Tyrrell[4] have all advised against too much interference, especially early. Tyrrell, in the London bombings, because of the scattered casualties, often had to let ocular injuries alone for 24 hours. He found to his surprise that he often got better results in these cases than in those that received immediate attention. As a result of this experience he began deliberately to let some of his cases alone for 24 or more hours. Patients who have perforating eye injuries often exhibit considerable shock and restlessness. If treated for shock and allowed to recover from it before the eye was treated, the patient often stood operation and repair of the eye much better.

People exposed to effects of demolition bombs are indescribably dirty. The dirt seems to have been blown right into the skin and the conjunctival sacs are filled with "mud." In these instances it is wise to irrigate the conjunctival sac gently a number of times at hourly intervals with very mild antiseptics before surgery or repair is attempted. The only urgent operation is excision of prolapsed irides and coverage of wound with a flap.

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Treatment of eye injuries

Lid injuries, conjunctival tears, corneal wounds, various types of penetrating injuries of the globe, prolapsed irides, are all surgical problems that require immediate care. This phase of the subject has recently been discussed by Hartmann.[5] I would like to emphasize one point, however; namely, the necessity of careful detailed repair of lid wounds to prevent notching and to protect the eye. If proper facilities are not available repair should not be attempted. Meyer Wiener[6] recommends that if facilities are not available the wound be cleaned up gently and moist compresses be applied over the eye, and that the patient be sent to the base hospital where proper repair can be made. The importance of gentle care in the handling of injuries bears emphasis. Rough treament may do a great deal of permanent damage.

Foreign bodies

(1) *Cornea.* When searching for foreign bodies one should not neglect to evert the upper lid, as large foreign bodies may be lodged there. A lash caught in the punctum also may cause a great many symptoms and may be overlooked.

In the removal of a *single foreign body* the case is handled as in civil practice. The importance of the aftercare should be kept in mind and the case followed until the cornea has healed. In cases where there is a circle of rust that cannot be removed easily it is well to keep the eye bandaged for 24 hours, at the end of which time enough infiltrate will have formed around the foreign body to facilitate its removal. The use of a dental burr often aids greatly in this procedure. If a foreign body spud is not available, the suggestion made by Harding[7] will be useful. He found that a regular stainless-steel hypodermic needle, 25 gauge, was a good substitute for a spud when mounted on a small, hollow, chrome-plated brass handle. In the absence of this handle the barrel of a tuberculin syringe will do nicely.

Multiple foreign bodies are frequently encountered and consist mostly of stone, sand, metal, and so forth, from bombs and artillery blasts. Do not try to remove all of them at once, but lavage and clean out the conjunctival sac, bandage the eye, and wait 24 to 48 hours. From experience in tattooing a cornea with India ink it is known that this tissue has a tendency to extrude minute foreign bodies. Thus we find at the end of 24 to 48 hours that many of the small foreign bodies have been extruded. In addition the corneal epithelium has had time to regenerate, and thus lessen the risk. The remaining foreign bodies can now be removed, a few at a time, under favorable circumstances. In some instances inert foreign bodies may be so deeply imbedded that their removal would do more damage and cause more interference with vision than if they were let alone. Limestone causes a good deal of irritation and therefore must be removed even though there are multiple foreign bodies.

(2) *Intraocular foreign bodies.* In the consideration of intraocular foreign bodies it is well to remember that they may be bilateral. One eye may be rather severely damaged and suggest the presence of an intraocular foreign body while the fellow eye appears to be normal. Often the point of entry is so small as to escape detection and yet the end result to vision may be most destructive and all out of proportion to the minute size of the foreign body. For this reason detailed examination of the fundus and X-ray study are indicated for the apparently well eye whenever there is a possibility of injury by multiple foreign bodies.

According to Loewenstein 90 percent of the intraocular foreign bodies in civil

practice are magnetic, while in war 90 percent of the foreign bodies are nonmetallic and consist principally of sand, stone, debris, and glass. The metallic foreign bodies are from hand grenades, large shells, and other explosives. Among this group there are many nonmagnetic foreign bodies, consisting of copper, copper with nickel alloy, aluminum, and lead. It is interesting that at one of the larger naval hospitals on the Pacific Coast up to January 1, 1943, there had been no cases of magnetic foreign body in the casualties returning from the South Pacific, although there were many ocular casualties.

The last war changed our ideas regarding the tolerance of intraocular foreign bodies. The tolerance is good to rock, concrete, aluminum, and lead. In addition, spontaneous extrusion of intraocular foreign bodies has been reported a number of times since Castelnau[8] first described this phenomenon in 1842. It apparently occurs far more frequently in the case of copper than of iron or other foreign bodies. Instances have been reported in which copper and other particles have remained in an eye for a long period of time. Often these become encapsulated and may cause no trouble for many years. Such a case came under my personal observation[9]—a piece of copper fragment from a percussion cap has been retained in the globe over a period of 46 years.

Copper and its alloys are nonmagnetic, and removal or attempted removal may cause more damage than the presence of the metal itself. Most of the copper foreign bodies seen are alloys with a relatively low percentage of copper. They may be well tolerated. At times they may be extruded along the path of entry. If the foreign body is not too large it may become absorbed with the formation of chalcosis.

Chalcosis of the lens, so-called copper cataract, was not recognized as a separate entity until World War I. According to Jess[10] there is a definite reason for its discovery as an entity at a comparatively recent date. During the first World War, because of the scarcity of copper, the various explosive shells were made of metal containing a relatively small percentage of copper. Consequently, if a particle of this metal entered the eye, the violent reaction produced by pure copper was not present; instead there was a slow oxidation of the copper with the production of chalcosis.

The characteristic picture of chalcosis, as a rule, begins to appear several years after the introduction of the foreign body. There is present on the lens a disciform opacity occupying the pupillary area. It is greenish gray in color and rather metallic in appearance. In marked cases, the color may be a definite green. The edges of the ring are often serrated, with lines radiating to the periphery of the lens. Under oblique illumination, the opacity appears rather dense, but, as a rule, little difficulty is experienced in seeing through it with the ophthalmoscope.

Under the higher power of the slit-lamp, this disciform cataract is seen to be composed of multiple minute particles that appear to be just below the capsule of the lens. There is also some discoloration of the iris.

Microscopic examination shows this opacity, which has been identified as copper carbonate, to be situated beneath the anterior capsule of the lens and the epithelial cells. In the more marked cases, this copper carbonate is found in the deeper layers of the lens.

The prognosis in these eyes seems to be fairly good. If the copper particle is small it may gradually become entirely absorbed. After the absorption or removal of the foreign body the chalcosis may

slowly disappear. In one bilateral case personally observed[11] a traumatic cataract developed in one eye and the typical picture of chalcosis in the other. Six years after the injury there was no X-ray evidence of a foreign body in either eye, and eight years after the injury the picture of chalcosis had almost entirely disappeared and the vision of the eye was 20/30 with correction.

Iron and steel. That there is spontaneous absorption of intraocular foreign bodies of iron is well known. The picture of siderosis is so familiar that description is unnecessary. Many such cases, in which there were disastrous results to the eye, are to be found in the literature.

This emphasizes the necessity of removal of iron or steel. The importance of X-ray examination cannot be overemphasized. The history, X-ray, and "magnet pull" all help to diagnose the presence of a magnetic foreign body. Their removal by the magnet is well understood. Recently several writers have stressed that in war surgery the foreign bodies should be removed only under favorable circumstances. If these do not exist it is much wiser to delay the attempted removal until the proper facilities are available.

Glass is well tolerated, as a rule, if the foreign body is in a position where there is no movement. It is important that all particles of glass in the conjunctiva and cornea be removed. Because of the difficulty of seeing these particles good magnification and adequate oblique illumination are essential. In civilian war injuries glass foreign bodies have been rather common, due to windows being blown in and broken. In the majority of glass injuries the eye is so severely damaged that little can be done.

Foreign bodies may be well tolerated in the lens if the entry has been through the iris, as in this instance the iris may very quickly become adherent to the capsule wound and thus prevent the formation of a traumatic cataract. One case has been observed for 10 years in which there was a small splinter of wood in the lens without the development of a cataract beyond a small amount of opacification immediately surrounding the foreign body.

CONTUSIONS

Contusion of the eyeball with its resultant rupture of the choroid, retinal hemorrhage, and detachment, was one of the commonest causes of blindness in World War I. According to Tyrrell and Loewenstein contusions to the eyes are common and very destructive in the present war.

Contusions from without cause the symptoms and changes that are so well known in civil practice. In the anterior chamber there may occur hemorrhage from the rupture of Schlemm's canal or from the iris; there may be iris tears and the well-known changes in the pupil, which may be permanent or may disappear after six to eight weeks. The lens may show a Vossius ring, rosette opacity, rupture, or luxation. In the retina, rupture of the choroid and retinal hemorrhages with detachment form the typical findings. Berlin's edema and hole in the macula are also noted at times. In a certain small percentage of cases delayed intraocular hemorrhage may occur three to five days after the injury.[12] The care of such cases of contusion is the same as that used in civil practice. The delayed intraocular (vitreous) hemorrhages, if extensive, clear slowly, at times requiring a year. On the whole, if the eye was apparently normal in the interim between the contusion and the delayed hemorrhage the ultimate prognosis for vision is good.

Orbital contusion. This usually results from missiles passing into or through the orbits above the level of the zygoma. Rifle and machine-gun bullets in their passage through the orbits destroy the bony frame. The enormous kinetic energy developed by these bullets and by the bone spicules, together with concussion waves imparted to the orbital contents, results in severe damage. In addition to the lesions noted under contusions from without, evulsion of the optic nerve occurs in orbital contusions. In this condition the optic nerve and the lamina cribrosa are torn from the scleral hole. Ophthalmoscopically the condition is recognized by the absence of the disc and vessels. Many cases are missed because of intraocular hemorrhage. In 50 percent of the cases the injury is caused by a thin, rodlike foreign body entering the orbit alongside the globe, or by temporal gunshot wounds. In addition to the nerve injury there are usually extensive chorioretinal changes.

ORBITAL INJURIES

As has already been stated, the explosive action of rifle and machine-gun bullets in wounds of the orbit is very destructive. All orbital injuries above the level of the zygoma should be considered as brain cases until proved otherwise, for the explosive effect of bullets on the bony walls of the orbit often causes rupture of the roof of the orbit. Do not explore the orbit too radically if at all—it may result in considerable damage. Many retained foreign bodies of the orbit are extruded. As Wiener[6] pointed out, emphysema and crepitation in the skin around the eye and in the lid mean fracture of the bony wall of the orbit with air from the nose infiltrating into the tissues. The fracture may not be visible by X ray.

The *optic nerve* may receive direct injuries. Bone fragments, tipped clinoids, and hemorrhage into the sheath may injure the optic nerve. In addition to evulsion of the optic nerve, oblique injuries may sever the nerve behind the optic disc, with resultant primary optic atrophy accompanied by extensive chorioretinal changes. These cases are seen in civil practice as a result of temporal gunshot wounds in attempted suicide. They have also been reported as war injuries.

Windage, or remote effect of explosive bombs together with sudden atmospheric expansion, may cause some queer and rather severe ocular injuries; such as, proptosis, rupture of the eyeball, and rupture of the choroid.

Sympathetic ophthalmia. The incidence of sympathetic ophthalmia in the last war, according to Greenwood,[13] was extremely low. The fear of sympathetic ophthalmia is exaggerated. It does not occur until seven or more days after injury, so that there is ample time to get the patient to a base hospital. The offending eye should not be enucleated indiscriminately should sympathetic ophthalmia develop, for at times the offending eye retains the better vision once the process has subsided.

BURNS OF THE EYELIDS AND GLOBE

Burns of the eyelids have recently been discussed in detail by Hartmann.[5] It is recognized that tannic acid should not be applied to the eyelids and face. The burned area should be gently cleansed with warm saline solution and the surrounding area with soap. Blisters should be opened and loose epidermis removed. After this a dressing is applied that will keep the burned area clean and that upon removal will not be damaging to the new epithelium. Hartmann advocated painting the burned surface several times with a

2-percent aqueous solution of mercurochrome.

Corneal burns may be caused by a number of agents, but are rare, for it is difficult to burn the cornea; usually only the epithelium is seared.

Incendiaries are not apt to be dangerous unless water is thrown on them, when they scatter burning fragments and may cause severe contact burns of the cornea.

Flame burns with scorching are the most common type of burn about the eyes, and are due to oven, furnace, or gasoline explosion. It should also be kept in mind that during the burning of a building gases may accumulate in the ceiling which explode when they come in contact with a gust of outside air. These burns at times may be very severe. The appearance of these scorching burns is usually serious; the cornea appears white, there is loss of vision, the lids are swollen. As a rule, however, the only damage to the cornea is a searing of the corneal epithelium which regenerates in 24 to 48 hours.

Contact burns with molten metal, wood, and so forth, are more serious, but even these usually appear to be worse than they really are.

The treatment of these burns is similar to that used in civil life. One point however does bear emphasis; namely, the avoidance of the routine application of anesthetics to the eye. These impair the epithelial regeneration and thus may not only delay healing but may also even encourage the formation of ulcers. After the eye has been carefully examined, for which anesthesia may be necessary, pain, if it persists, should be controlled by oral or hypodermic administration.

WAR GAS INJURIES

It has been stated that gas has not been used in this present war. In San Francisco, draft-board examination of Chinese who have been in the Chinese Army has given unmistakable evidence of its use in China by the Japanese. Most of our knowledge, however, is based on war experiences in the last World War and on animal experimentation. While gas may not be used, both sides are prepared for its employment, and if the situation becomes too desperate the enemy may again resort to its use. Therefore it is important that the effect and treatment of war gases be known.

In order to understand the basis of various suggested treatments it is essential to understand the pharmacologic basis of their action. This has been described by Leake and Marsh.[14] If gases are used they will probably be mixed; it therefore seems unwise to worry about specific identification and specific management of potential injury, if such identification is based on so indefinite a criterion as the odor.

Absorption of ordinary war gases and their many obvious chemical relatives may be inhibited by oxidation, neutralizing hydrolysis, or adsorption. For civilian use these methods may be applied from materials found in the average home Since the war gases in general are decomposed and poorly soluble in water a wet cloth tied over the nose and mouth is a relatively effective barrier to the passage of such vapors to the nose, throat, and lungs.

The most readily available oxidizing agents are the common kitchen bleaching agents such as "Clorox", "Purex", "Sani-Clor", and the like. These are buffered 3- to 5-percent solutions of sodium hypochlorite and are non-irritating for blotting the skin, but should be diluted for application to the mucous membranes, for washing the skin, or for wetting cloths to breathe through. It has been shown conclusively that these solutions are ef-

fective in converting both mustard gas and Lewisite into nontoxic residues.

For alkaline hydrolysis, a 2-percent sodium bicarbonate solution is advocated. It can be easily prepared even in a blacked-out room, by dissolving a teaspoonful of baking soda in a glass of water. This solution is to be used in washing out the eyes, nose, and throat, and for wetting cloths to breathe through.

The most effective and easily available detergent adsorbent is lather from ordinary soap and water or soap flakes. This is particularly useful in preventing skin injury from suspected contact with the vesicant gases. The hands, the face, and especially the skin around the eyes should be thoroughly washed by this method.

The common vesicant gases are soluble in kerosene, gasoline, acetone, carbon tetrachloride, and similar fat solvents. It was thought the use of these agents would be useful. Marsh and Leake,[15] however, have shown that even under controlled conditions they are much less satisfactory than lather or hypochlorite.

Several different types of gas have been used and a more detailed account of each seems advisable.

Tear gas. The vapor of lacrimator gases is unimportant except for its nuisance value. On rare occasions if the liquid gets into the eye—as, for example, with the accidental discharge of tear-gas guns at close range—the action is more corrosive and resembles an acid burn. The chemosis in these cases at times becomes so marked that canthotomy is indicated.

Where some of the solution has caused a reaction the instillation of the following solution is advocated:

Sodium sulfate	0.4 gm.
Glycerine	75.0 c.c.
Water	100.0 c.c.

If this solution is not available then copious lavage with water is indicated.

Most cases of burns of the eye were from the vesicant gases. These may act like ammonia in that there is an immediate severe burn with great pain, followed by a period of healing when the eye appears to be returned to normal, and then gradual deterioration. This, however, is only in the severe cases. There are two principal vesicant gases: mustard and Lewisite. Of them mustard gas is the more important.

Mustard gas. This is a dark-brownish liquid that changes to a colorless gas and has an odor that has been described as that of horseradish or garlic. Mustard gas is especially soluble in animal fat, which accounts for its rapid penetration into the skin and the lid margin. It is not dissolved in lacrimal secretion, but acts upon cornea and conjunctiva as a protoplasmic poison, extending damage from cell to cell deep into the tissue. Mustard gas vaporizes slowly, and its emanation from contaminated articles forms a continued source of danger. Repeated minimal exposures are cumulative in their effect.

Godwin,[16] in a review of the literature, summarized the symptoms, clinical picture of the severe type, and the pathology.

Symptoms. After exposure to mustard vapor, a latent period of from 2 to 48 hours precedes symptoms; if liquid is contacted, almost immediate discomfort is experienced. A burning sensation is followed by pain in and about the eye, accompanied by a sandy feeling under the lids. Lacrimation is profuse, and blepharospasm may be intense enough to dam back the tears and prevent voluntary opening.

Clinical Picture of Severe Type. The exposed cornea becomes devitalized, revealing an "orange-peel" texture, or it may be eroded. Iris spasm produces miosis. The surface conjunctiva is destroyed,

and the resulting necrotic membrane as well as its underlying coagulative exudate may exert enough tissue pressure to blanch the circulation and prevent chemosis. The remainder of the conjunctiva is affected less, and may be chemotic to the extent of prolapse. During resolution, the pale area corresponding to the palpebral aperture (which may be mistaken at first for the more normal area) gains chemosis, as pressure is released, before final blanching occurs. Convalescence is gradual and may require several months.

Pathology. The pathology of severe corneal burns from mustard gas has been described in the rabbit,[17, 18] and in man.[19] The epithelium is destroyed immediately, and, within 15 minutes, edema and necrosis of the stroma follow. After five hours, polymorphonuclear infiltration appears at the limbus and spreads into the stroma. A week later, edema subsides, and the opacity improves. Vascularization of the area continues for weeks. After several years, the area may be subject to recurrent ulceration. Fibrosis forms the picture of healing.

Severe and progressive ocular injuries may be induced by prolonged exposure to a concentration as low as 1:10,000,000. Splashing of the liquid into the eye always causes a very destructive lesion.

Ocular involvement was found to be present in 75 to 90 percent of all mustard-gas casualties. These divide themselves into three groups:

1. In 75 percent of the cases there was a mild conjunctival irritation that cleared in one to three weeks with symptomatic treatment.

2. Severe conjunctival involvement was found in 15 percent, with a horizontal band of white chemosis between the lids. Recovery took place in from four to six weeks.

3. The third group, comprising 10 percent of cases, showed corneal erosion. In this group two to three months were required for convalescence. In spite of potential danger serious immediate complications were infrequent in the war of 1914-1918.

Since no fully satisfactory neutralizing agents have been found which will be tolerated by the eye, prophylaxis is important. As soon as the first odor of horseradish is detected the gas mask should be put on immediately.[19] When the mask is taken off care should be exercised so that the eyes are not rubbed, as the hands may be contaminated and thus injure the eyes.

Treatment. The treatment is that recommended by Gifford[20] in the Military Surgical Manual on Ophthalmology of the National Research Council, and is summarized in the chronologic sequence of treatment.

1. Reassure the patient by opening the lids so that he can see he is not blind. It may be necessary to use pontocaine or butyn, but no cocaine.

2. Each eye is to be irrigated two minutes with 1.5-percent solution of sodium bicarbonate; 0.9-percent saline, or 7-percent boric-acid solution. Of these the sodium bicarbonate is probably the most desirable and most easily prepared, in a solution of a teaspoonful to a glass of water.

3. If photophobia is marked or the cornea is involved atropine is instilled until symptoms or the iritis subsides.

4. If there are several corneal or conjunctival lesions, after *24 hours* instil liquid paraffin, cod-liver oil, vaseline, or mineral oil to prevent adhesions. This lapse of time is to allow the patient to leave the gassed area or allow time for the gas to disappear, as the oil serves to concentrate mustard gas and if the gas is still present in the area it would do further damage to the eye.

5. Dark glasses—*do not bandage.* The dark glasses should be removed as early as possible to prevent neurasthenic symptoms.

6. Mild silver protein, 10 percent, followed by boric irrigation, three times daily in severe cases.

7. The action of mustard gas on the cornea produces a good bacteriologic medium, so secondary infection is fairly common. When this is present sulfathiazole ointment is indicated. It should not, however, be used routinely, as experience has shown that in a clear wound it retards healing. During convalescence 0.25-percent zinc sulphate drops with adrenalin are advised.

Lewisite. This is a brown liquid that changes to a colorless gas, and has the odor of geraniums. It produces a more immediate, painful, and rapid destruction of the eye than does mustard gas. In addition, constitutional symptoms of arsenic poisoning may develop.

Treatment must be prompt. Lewisite is rapidly hydrolyzed and oxidized; hence the use of copious irrigations with 1.5-percent solution of sodium bicarbonate or water is indicated. The treatment of the burns is essentially the same as that for mustard gas.

Phosgene is another gas that may be used. It smells like silage and is primarily a lung irritant that may produce collapse and heart failure. The vapor produces only mild irritation of the eyes, which clears uneventfully on symptomatic treatment. Retinal hemorrhage may occur secondarily to anoxemia, which is produced by the pulmonary edema.

In 1914-1918, when gases were used they were mixed. If they are used again they will probably consist of mixtures. Knowing that their pharmacologic action is basically the same, rather than lose time trying to identify the gas, it seems best to remember that the action may be inhibited by neutralizing hydrolysis. Thus if the eyes, nose, or throat is irritated from possible exposure to gas, it should be washed with a solution of a teaspoonful of baking soda to a glass of water. The hands and face should be washed thoroughly with a good lather of soap and rinsed copiously with water.

Conclusion

In conclusion it seems worthwhile to stress certain fundamental principles that should be kept in mind in dealing with ocular war injuries.

1. Penetrating wounds of the globe, iris prolapse, and lid injury require immediate surgical care if the proper facilities are available. If not, the wounds should be cleaned, a dressing applied, and the patient sent to a base where proper facilities are available. In the event of a lid injury a moist dressing is indicated. In cleaning up lid injuries debridement technique used in other wounds would be ruinous to the lids and conjunctiva where every millimeter of tissue must be saved.

2. As to foreign bodies of the cornea and globe, experience indicates that it is best not to interfere until the patient has recovered from shock and until the foreign bodies can be removed under favorable circumstances. It is also well to remember that minute foreign bodies of the cornea are often spontaneously extruded during the first 24 hours.

3. In cases of thermal burns of the cornea the routine, continued use of anesthetics is to be avoided, as any of the anesthetics interfere with the healing of the cornea. In general it has been found that unless there is some definite indication for the local use of drugs, the eyes recover from injury more rapidly if these are not employed.

4. War-gas burns of the eyes or ex-

posure to war gas requires immediate attention. The most effective universal treatment, irrespective of the type of gas, or in the event of a mixture of gases, would appear to be that based on an alkaline hydrolysis by the use of approximately 2-percent sodium bicarbonate. This can be simply made by dissolving a teaspoonful of baking soda in a glass of water.

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OCULAR FINDINGS IN A CASE OF PERIARTERITIS NODOSA

A CASE REPORT*

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Periarteritis nodosa can no longer be considered a rare disease, approximately 400 cases having been reported in the literature since it was first described by Kussmaul and Maier in 1866. It is a primary vascular disease involving the small and medium-sized arteries of the muscular type. Pathologically the disease consists of necrosis of the adventitia and muscularis of these vessels and pleomorphic inflammatory cellular infiltration, usually consisting of histiocytes, polymorphonuclear neutrophiles, and eosinophiles. Later the endothelium may proliferate and occlude the lumen or become necrotic and lead to thrombosis, or small aneurysms may form due to the weakening of the vessel wall. Since the entire thickness of the wall is affected rather than the adventitia alone, panarteritis nodosa has been suggested as a more accurate name.

There is no agreement as to the cause of the disease. After conducting elaborate studies on rabbits, Harris and Friedrichs concluded that it was produced by an ultra virus, but their work has not been confirmed. Swift, Derick, and Hitchcock described the lesions as a low-grade allergic response to some causative agent, bacteria, or toxin. Cameron and Laidlaw reported a case which they considered due to parasitic infestation. Syphilis has been discarded as a direct etiologic factor. Possibly periarteritis nodosa is the reaction of the arterial system to diverse infectious diseases.

Periarteritis nodosa may occur at any age, although 50 percent of the cases fall in the 20 to 40-years age group. It has been reported more frequently in males in a ratio of four to one. The disease lasts from a few weeks to a year and usually terminates fatally. The onset is often insidious, accompanied by fever, emaciation, weakness, pains in the extremities, joints, and abdomen. Blood pressure is frequently elevated, and renal insufficiency may appear early, late, or in the terminal stage. Many of the symptoms are secondary to the local disturbances in blood supply, and depend on their severity and distribution. When lesions occur in the skin, diagnosis can be made from a biopsy specimen. The nodular lesions on the arteries may attain macroscopic size, but frequently the lesions are microscopic, and a definite diagnosis is made only at autopsy. The vessels of the gastrointestinal tract and the heart are affected in the majority of the cases which are diagnosed *post mortem*, and the vessels of the extremities and the brain in a smaller number.

Eye findings have been reported in relatively few cases. In 1899 Müller described characteristic changes in the retinal arteries in a case of periarteritis nodosa. Similar changes were found in the small vessels of the brain. When Goldstein and Wexler reported in 1929 a detailed study of the eye findings in a case of periarteritis nodosa which came to autopsy, they could find no other reference in the literature to lesions in the ocular vessels. In the same year v. Herrenschwand published one case in which

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a periarteritic nodule was found on the central retinal artery, as well as involvement of the long posterior ciliary vessels. Böck reported a case in which the ciliary arteries were affected, and a second in which there was gross involvement of the vessels of the choroid and ciliary body. Christeller (1926), Friedenwald and Rones (1931), and Halpern and Trubek (1933) each reported one case with lesions in the choroidal vessels, whereas the retinal arteries were normal.

Few fundus reports are found in the literature, and, when mentioned, the eyegrounds were usually normal or renal retinitis was described. In 1935 King reported for the first time papilledema associated with periarteritis nodosa. In his case the diagnosis was made from a biopsy specimen, and the patient recovered. This patient had recurrent subacute uveitis in one eye, followed by secondary glaucoma which necessitated enucleation. Microscopic examination of the eye revealed no involvement of the arteries of the uveal tract, but there were changes in the retinal vessels. In the case to be reported there was also papilledema, and it is unique in that the initial symptom of disease was visual disturbance.

Case report

J. B., a colored man, aged 38 years, was admitted to the eye service of the Cincinnati General Hospital on October 8, 1941, complaining of failing vision of four-weeks' duration. There were no other ocular signs nor symptoms.

The patient gave a history of frequent headaches and dizzy spells upon arising in the morning. Two years earlier a positive Wassermann reaction had been obtained in a routine examination, and the patient had received a year's intensive treatment for syphilis. His mother had died of hypertension at the age of 67 years.

Uncorrected vision was O.D. 20/25, O.S. 20/50; correctable in both eyes to 20/20. Examination of the lids, lacrimal sacs, conjunctivas, corneas, and anterior chambers revealed no pathologic changes. Pupils were round and equal, and reacted to light and in accommodation. The lenses and media were clear. Examination of the fundi oculi led to the following observations: O.D. The disc was round, hyperemic, and elevated two diopters. The margins were blurred, and many small hemorrhages were seen on and around the disc. The retinal arteries were diminished in caliber, and the veins were engorged and tortuous. Venous pulsations were easily discernible. An increased arterial reflex and copper-wire coloring were also noted. The smaller arterioles, especially about the macula, exhibited tortuosity. Pronounced nicking of veins by arteries was present. Many small flame-shaped hemorrhages were seen throughout the retina, but appeared in greater numbers near the macula. The macula also contained colloidlike exudates, areas of fatty and hyalin degeneration. O.S. The picture in the left eye was similar to that in the right except that the papilledema was slightly more pronounced. The peripheral fields of vision were normal in extent. Central fields showed enlarged blind spots. Intraocular tension (Schiötz) in each eye was 19 mm. Hg.

The general physical examination was essentially negative except for blood pressure, which registered 244/156. The blood Wassermann reaction was negative; the urea nitrogen 26 mg. percent. The clinical diagnosis was malignant hypertension and hypertensive retinopathy.

Bed rest and expectant treatment were of no avail. The retinal hemorrhages multiplied, and papilledema increased to five diopters. A month after the first examination the patient developed constant pre-

cordial pain, and the possibility of coronary occlusion was considered. A few days later an aortic diastolic murmur and palpable and audible gallop rhythm were present. The blood urea nitrogen was 60 mg. percent. The patient became comatose and died the following day, six weeks after hospitalization.

The autopsy was performed by Dr. Harvey W. Hessler, of the Pathology Department, Cincinnati General Hospital. Anatomic diagnosis: Malignant nephrosclerosis; pulmonary congestion and edema; lobular pneumonia and pulmonary infarcts; marked left ventricular myocardial hypertrophy and cardiac dilatation; chronic passive congestion of the liver and spleen; syphilitc aortitis; chronic cholecystitis; chronic interstitial prostatitis; chronic epididymitis; chronic pulmonary emphysema; petechial hemorrhages in the pleurae; cerebral edema.

At autopsy the posterior half of the left eye was removed and sent to the Holmes Hospital Ophthalmological Laboratory. The pathologic diagnosis was: Retinopathy of malignant hypertension; marked arteriolar sclerosis of the choroid; papilledema.

Microscopic description: The arteries in the choroid showed very marked changes in their walls whereas the veins and choriocapillaris were relatively unaffected. In some arteries there was hypertrophy of the media, in others great thickening of the intima sometimes producing occlusion, or a combination of both. In some vessels the walls appeared to be hyalinized and almost structureless, but necrosis was not conspicuous and there was practically no cellular infiltration.

Fluid had collected beneath the retina, and the edema of the retina itself was marked, especially in the peripapillary and macular regions. Occasional small hemorrhages were scattered throughout the retina, and were much more numerous around the disc and macula. In the latter area many occurred in the outer nuclear layer. The larger retinal arteries showed thickening of the media, but the changes were much less marked than in the choroidal vessels. Papilledema had produced a broad neuritic roll displacing laterally the retinal layers. There were edema deposits in the internuclear layer, especially large and numerous in the macular area. Some were fibrinous, others hyalin in appearance; a few contained macrophages. Near the posterior pole the internal limiting membrane was detached in many places.

Because of the interesting vascular lesions presented, all of the microscopic sections of this case were referred to Dr. Pearl M. Zeek, Pathology Department, for special study. She stated that in her opinion this case presented a combination of: 1, advanced generalized arteriolosclerosis with terminal focal arteriolonecrosis; 2, focal syphilitic arteriolitis; and 3, focal periarteritis nodosa. The kidney pedicle, gall bladder, testis, epididymis, and prostate presented all three types of lesions, while in certain other locations only one or two of them were found. In the choroid the predominating vascular lesion was arteriolosclerosis with slight terminal necrosis. A few vessels in both retina and choroid showed inflammatory changes suggesting in some syphilitic arteriolitis and in others early periarteritis nodosa. Certainly the sum total of the departures from normal in the eye was not typical of any one of the three conditions, but represented the result of a combination of inflammatory and degenerative vascular lesions.

Discussion

In reviewing 100 cases of periarteritis nodosa for the sequence of symptoms, Boyd found that only one patient had

complained first of the eyes. Ocular manifestations appeared in every stage of the disease but were relatively rare, only one fourth of the patients complaining of them. The nature of the ocular signs and symptoms was not stated.

Goldstein and Wexler were the first to describe intraocular vascular lesions in a case of periarteritis nodosa. These were found only in the choroidal arteries in the eye, and were rather atypical. Ophthalmoscopic examination was made only once in this case and was negative. Friedenwald and Rones reported a case of periarteritis nodosa which developed typical albuminuric retinitis while under observation. The patient died a month later. Microscopically, there was marked arteriolar sclerosis of retinal and choroidal vessels, but no inflammatory lesion in the retina, and only a few small vessels in the choroid showed suggestive mononuclear infiltration. Several typical periarteritic nodules were seen in short ciliary arteries just outside of the sclera. The authors concluded that ophthalmoscopically and microscopically the retinal picture did not differ from that found in uncomplicated cases of albuminuric retinitis. In King's case, the first in which true papilledema associated with periarteritis nodosa was described, the excised eye showed intense subacute uveitis. The retina was also involved in the inflammatory process, the arteries and periarterial zones being chiefly affected. No characteristic lesions were found in the arteries of the uveal tract.

In our case arteriolar sclerosis was extreme in the choroidal vessels, moderate in the retinal arteries. The suggestive inflammatory changes in the vessels, described by Dr. Zeek were relatively slight. The ophthalmoscopic and pathologic picture of retinopathy did not appear to differ from that in other cases of malignant hypertension. In our opinion fundus lesions directly due to periarteritis nodosa of ocular vessels have not been described. The caliber of intracular vessels may be a factor in the rare occurrence of eye lesions in this disease, since the vessels in the eye are smaller than those usually affected by periarteritis nodosa in other organs of the body.

Summary

Failing vision due to retinopathy typical of malignant hypertension was the first symptom in a proved case of periarteritis nodosa.

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A SUMMARY OF FINDINGS AT THE EYE EXAMINATION OF PREPARATORY-SCHOOL BOYS*†

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As a part of the annual medical examination of their students many preparatory schools and colleges include some sort of inspection of the eyes, a test for visual acuity, and a color-vision test; the results of such tests in colleges have been summarized by Diehl,[1] who reports that about 11 percent have uncorrected or inadequately corrected defects. This type of testing may discover a significant number of individuals who should be referred to an ophthalmologist for a more thorough examination, but even when rigid conditions regarding distance and illumination of charts are observed, these tests do not appear to be very efficient, and it has seemed desirable to attempt to develop more satisfactory screening devices. Recently an improved method of testing the vision of school children has been reported by one of us (A. E. S.[2]).

At the beginning of the school year 1940, 741 preparatory-school students were given an eye examination according to the method described below, and at the beginning of the school year 1941, 715 students at the same school were given a similar examination. The results of these examinations and some observations upon them are herein reported. It has been our purpose to develop and evaluate various procedures that can be used to select those individuals who require an examination by an eye specialist and, by reporting our findings in this group, to emphasize the desirability of giving members of similar groups an eye examination. The results of our examination will suggest the answer to the question of whether the economic status, privileged background, and opportunity for adequate medical care of the average preparatory-school student are valid reasons for omitting a careful test of the vision from his annual medical examination. All but about 4 percent of these students have always been resident in the United States. Approximately 60 percent of these students came from families having incomes ranging from $3,000 to $20,000 a year, and about 20 percent were from families whose income is usually greater than the latter amount. They ranged in age from 13 to 19 years. The results of the 1,456

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examinations concern 1,009 different individuals; 447 individuals were examined in both 1940 and 1941.

The examinations, the results of which we are reporting, included several procedures that are not essential parts of an adequate vision-testing program; many procedures were carried out so that the relative efficiency of different tests might be evaluated, and so that standards for some tests might be established. In the 1941 survey some of the methods used in 1940 were altered and a few new procedures were introduced.

In both the 1940 and the 1941 surveys the services of three individuals were used; namely, two technicians and one ophthalmologist. Each student was first seen by one of the technicians who entered his name, age, the date, and his serial number upon a specially prepared form; subsequently this technician recorded the responses to a color-vision test (in 1940 the Ishihara and in 1941 the pseudo-isochromatic plates[3] of the American Optical Company were used), and recorded a brief history that included answers to such questions as when were glasses last prescribed, and whether such symptoms as headaches, blurred vision, or red eyes were present. In the 1941 survey the history taking was done by the ophthalmologist.

The next part of the examination was carried out by the second technician, who used in 1940 a battery of tests which have been previously described by one of us as the Massachusetts vision test.[2] This test includes (1) a determination of visual acuity of the right, left, and both eyes, expressed in terms of the Snellen fraction; (2) a +1.50D.-sphere test for the detection of latent hypermetropia; and (3) an estimation of the degree of heterophoria present. Visual acuity was tested by means of an artificially illuminated Snellen chart placed 20 feet from the subject, and the vision for each and both eyes was recorded; if glasses were worn by the subject, naked vision was not tested. The test for latent hypermetropia was carried out by instructing the examinee to attempt to read the Snellen chart through a pair of +1.50D. spheres mounted in zylonite frames; ability to read the 20/20 line was scored as a failure. For the measurement of heterophoria two pairs of zylonite frames were used: one frame contained a red multiple Maddox rod for the right eye mounted horizontally and no lens for the left eye, and the other frame contained a red multiple Maddox rod mounted vertically for the right eye and no lens for the left eye. When the test is made at 20 feet the object of fixation is a small clear 5-watt bulb that projects through the window of a picture of a house: the lateral dimensions of the house are calibrated to be equivalent to 6 prism diopters of esophoria and 4 prism diopters of exophoria at a distance of 20 feet, the vertical dimension of the window is equivalent to 1.25 prism diopters of right and left hyperphoria; the presence of the projected vertical streak through the house or the horizontal streak in the window constitute a successful performance. The near-phoria test was made by utilizing a pinhole light source with a pencil type of flashlight concealed in a block of wood whose width was calibrated for 6 prism diopters of esophoria and 8 prism diopters of exophoria, and whose face had a small picture for fixation so that accommodation would be used. A 16-inch cord was attached to the block so that a proper distance from the subject could be maintained. The presence of the vertical streak within the margins of the block constituted a successful performance. No quantitative measurements of heterophoria were made. Each subject was marked as either passing or failing each of the three tests.

In addition to these three tests the technician also measured the near points of accommodation for each eye, noting the nearest point at which fine print could be seen clearly. In the 1941 survey this technician measured visual acuity by means of a Snellen chart as in 1940 but recorded data for naked vision as well as vision with glasses wherever glasses were worn; determined the presence of latent hypermetropia as in 1940; measured the near points of accommodation for each eye as in 1940; and made quantitative measurements of heterophoria. In 1941 the measurements of muscle balance made at 20 feet utilized the Maddox rod and a chart calibrated from 1 prism diopter to 12 prism diopters on the horizontal and from 1 prism diopter to 6 prism diopters on the vertical axis. When heterophoria was measured at 16 inches a displacing prism test (Graefe) was used and quantitative data recorded.

The third part of the examination was carried out by the ophthalmologist. He noted any abnormalities of the external eyes, pupils, and fundi; recorded the results of a cover test for muscle imbalance; determined the refractive error by retinoscopy; determined the near point of convergence; and made a recommendation on the basis of all the data that had been obtained. In the 1941 survey the ophthalmologist recorded the vision history. The cover-test results were roughly classified as zero, mild, moderate, or marked, depending upon the amplitude of recovery movement noted; in 1941 this test was made by utilizing a bar of prisms and the results were expressed in prism diopters. The refractive error as determined by retinoscopy in both 1940 and 1941 was recorded under emmetropia, hyperopia, hyperopic astigmatism or mixed astigmatism, and the degree of the conditions was considered, arbitrarily, low (0 to 1D.), moderate (1D. to 2D.), or high (over 2D.). The determination of the refractive error was made quickly by using only five lenses (−0.50D. sph., +0.50D. sph., +1.50D. sph., +2.50D. sph., and +3.50D. sph.) at a skiascopy distance of 26 inches and by having the examinee fixate a remote object; the error was fixed as that occurring between those two succeeding lenses which gave a "with" and "against" movement. The near point of convergence was determined objectively by noting that distance at which binocular fixation was lost to an approaching pencil point. In the 1941 survey the ophthalmologist asked questions relating to the type, frequency, and severity of headache; how long glasses had been worn; how recently vision had been examined, and how constantly glasses were worn; whether or not blurred vision at distance and near was present; and whether "car sickness," red eyes, or diplopia was occasionally noted by the subject. At the completion of the examination the ophthalmologist made one of the following recommendations: *Pass*—this decision was made when there was no refractive error, when the subject had been recently examined and adequately treated, and when the examinee has some error for which he could adequately compensate and from which he had no symptoms; *Refer*—this decision was made when there was indication for further examination of the eyes either on the basis of some abnormality or because of the presence of symptoms referable to the eye; and *Refer, symptoms*—this decision was made on all borderline cases and implied that a further eye examination should be made if symptoms of eyestrain or other indications should develop in the future.

The division of the procedures of this examination among three individuals and the inclusion in it of only such tests as

could be performed quickly and without complicated instruments made it possible to complete the tests within a five-minute period. The present report describes our results with a variety of tests and it should be emphasized that we do not advise that all or even the majority of these procedures be included in any adequate visual examination designed to screen out those individuals who should be referred to an eye specialist for further study.

Results

1. *Color vision.* About 5 percent were found to have deficient color vision. A report describing a brief method of testing color vision and using pseudo-isochromatic plates has recently been published.[4]

2. *Headache.* In the 1940 examination the questions regarding headache were asked by a technician, and 23 percent of the group were recorded as having headache; in the 1941 examination questions regarding headache were asked by the ophthalmologist, and, although 16 percent were recorded as having headache, in only 3 percent of the group was this symptom considered significant. Care in wording and manner of asking these questions and experience in the interpretation of replies are necessary.

Blurred vision. In the 1940 examination, when the questions were asked by the technician, about 5 percent were recorded as having blurred vision for near and 17 percent for distant objects. At the 1941 examination about 18 percent were noted as having blurred vision for near and about 5 percent for distant objects; about 12 percent more complained of blurred vision for distant objects when glasses were not worn.

Red eyes. Sixteen of the 715 in the 1941 group (2.2 percent) complained of redness of the eyes; at the 1940 examination 14 percent (of 741 students) were recorded as having this symptom.

Car sickness. This symptom was present in seven members of the 1941 group. It is our impression that many of the group used to have this symptom during their earlier years but these data were not recorded.

3. *Visual acuity.* In the 1940 examination the vision for the poorer eye, with glasses if glasses were worn, was recorded. Eighty-two percent were found to have 20/20 vision; 7.7 percent had 20/30; 6.5 percent had 20/40; 1.5 percent had 20/50; 0.8 percent had 20/70; and 1.2 percent had 20/200 vision in the poorer eye.

In 1941 the visual acuity of each and both eyes without glasses was measured and recorded for the entire group. The complete data are given in table 1. It will be seen that visual acuity in either eye was 20/20 in about 75 percent of the group, between 20/30 and 20/70 in about 12 percent, and 20/100 or less in approximately 13 percent. Of those in the group who had no glasses 6 (1.3 percent) had 20/30 vision in either eye and 13 (2.7 percent) had less than 20/30 vision in either eye.

Glasses were worn by 249 (34.8 percent) of this group; visual acuity with glasses for both eyes was found to be 20/20 in 87 percent, 20/30 in 8.8 percent, 20/40 in 3.2 percent, and only one individual had 20/70 and one other 20/100 vision.

Glasses were owned by 41.6 percent of the 1940 group; 18 percent of these wore their glasses very rarely, 65 percent wore them only for reading, and the remainder wore them constantly.

Cover test. In 1940 the cover-test results were classified qualitatively. At near, 65 percent were recorded as having orthophoria, 1.93 percent as moderate esophoria, and 15 percent as moderate exophoria. At distance, 94 percent were rated

orthophoria, 1.5 percent as moderate esophoria, and 2.6 percent as moderate exophoria. In 1941 quantitative measurements were used. With this test 5 (0.6 percent) had esophoria of more than 6 prism diopters at near and 23 (3.2 percent) had 8 or more prism diopters of exophoria. Quantitative measurements of heterophoria were not made in 1940. Eight (1 percent) failed the test on the vertical axis, 24 (3.2 percent) failed on the horizontal at distance, and 23 (3.1 percent) at near. In 1941 quantitative measurements of muscle balance were

TABLE 1

VISUAL ACUITY OF MEMBERS OF THE 1941 GROUP TAKEN WITHOUT GLASSES WHETHER OR NOT GLASSES WERE USUALLY WORN

	No. O.D.	Percent	No. O.S.	Percent	No. O.U.	Percent
20/20	539	75.70	550	77.36	570	80.06
20/30	25	3.51	22	3.09	21	2.95
20/40	20	2.81	23	3.23	27	3.79
20/50	13	1.83	13	1.83	12	1.69
20/70	23	3.23	20	2.81	21	2.95
20/100	18	2.53	17	2.39	18	2.53
20/200	51	7.16	49	6.89	29	4.07
5/200	4	0.56	4	0.56	1	0.14
10/200	19	2.67	13	1.83	13	1.83
Not recorded	3	0.42	4	0.56	3	0.42
Total	715		715		715	

exophoria. At distance, 5 (0.6 percent). had esophoria greater than 8 prism diopters, and 6 (0.8 percent) had exophoria greater than 6 prism diopters.

4. *Hypermetropia.* A significant degree of hypermetropia is considered to be present when the 20/20 line can be read by either eye through a +1.50D. lens. The data obtained by this test were similar in 1940 and 1941; in the latter year 3.7 percent had 20/20 vision through a +1.50D. lens before the right eye, 3.2 percent had 20/20 when that lens was held before the left eye, and 7.5 percent when +1.50D. lenses were held before both eyes. Of the 466 individuals who did not have glasses 46 (10 percent) had 20/20 vision through the +1.50D. lens with either or both eyes.

5. *Heterophoria.* Failure for distance was recorded when more than 6 prism diopters of esophoria or 4 prism diopters of exophoria or 1.50 prism diopters of hyperphoria were present; failure at near was recorded for more than 6 prism diopters of esophoria or 8 prism diopters made. With the Maddox rod 10 (1.3 percent) were found to have a distance vertical phoria of more than 1.50 prism diopters, 2 (0.2 percent) distance horizontal esophoria of more than 8 prism diopters, and 7 (0.9 percent) a distance horizontal exophoria of more than 6 prism diopters. With the displacing prism test (Graefe) at 16 inches, 8 (1.1 percent) individuals were found to have esophoria of 6 prism diopters or more and 20 (2.7 percent) to have exophoria of 8 diopters or more. Tables 2, 3, and 4 show the distribution of these measurements within the 1941 group.

Of the group who had 20/20 vision in both eyes or 20/30 in either eye there were 8 who had more than 1.50 diopters of hyperphoria, 25 who had more than 6 diopters of esophoria (distance), 7 with more than 4 diopters of exophoria (distance), 3 had more than 6 diopters of esophoria (near), and 8 had more than 8 diopters of exophoria (near). All three of the individuals who had more than 6 diopters of esophoria at near were also in-

cluded in either the hyperphoria or esophoria (distance) group; but only 2 of the 8 with more than 8 diopters exophoria (near) were included in any of the other groups. Only 4 of the 25 who had more than 6 diopters of esophoria (distance) were included in other groups. There were 45 different individuals (6.2 percent of the 715 individuals) all of whom had either 20/20 vision in both eyes or 20/30 vision in only one eye who had a significant degree of heterophoria.

TABLE 2

DISTRIBUTION OF HYPERPHORIA MEASUREMENTS (MADDOX ROD) IN MEMBERS OF 1941 GROUP

	No.	Percent	No.	Percent
R.H.				
½	1	.14		
1	74	10.56		
1½	8	1.14		
2	3	.43		
3	2	.29		
4	2	.29		
Total			90	12.84
L.H.				
1	7	1.00		
2	2	.29		
3	0			
4	1	.14		
Total			10	1.40
Orthophoria			600	83.91
Not recorded			15	2.10
Total			715	

Note: The high incidence of right hyperphoria (90 cases) as compared with left hyperphoria (10 cases) is probably related to the fact that the tests were made with the Maddox rod always before the right eye.

6. *Near point of accommodation.* In 1940 the range of near-point accommodation (O.S.) was from 7 to 13 cm.; in 1941 it ranged from 5 to 16 cm.; the mode fell at 10 cm. each year. The range (O.D.) in 1940 was from 7 to 13 cm. and in 1941 from 6 to 15 cm.; the mode fell at 10 cm. each year. It should be noted that the near point cannot be considered as an index of amplitude of accommodation, since the refractive error was not corrected when this distance was measured.

7. *Near-point convergence.* As measured objectively 17 (2.4 percent) were found to have a near point of convergence greater than 12 cm. in 1940, and 14 (1.9 percent) a measurement greater than 14 cm. in 1941; about 40 percent each year had a near point of less than 7 cm., but in only 5 out of the 715 members of the 1941 group was the near point less than 4 cm. Our experience with this test raises the question of whether more accurate measurements can be obtained by

TABLE 3

DISTRIBUTION OF ESOPHORIA AND EXOPHORIA MEASUREMENTS AT DISTANCE (MADDOX ROD) IN MEMBERS OF THE 1941 GROUP

	No.	Percent	Total No.	Percent
Esophoria				
1	154	21.60		
1½	3	.42		
2	117	16.41		
2½	1	.14		
3	57	7.99		
4	33	4.63		
5	11	1.54		
6	22	3.09		
7	14	1.96		
8	14	1.96		
9	0	0		
10	2	.28		
Total			428	60.03
Exophoria				
1	60	8.42		
1½	1	.14		
2	31	4.35		
3	12	1.68		
4	4	.56		
5	1	.14		
6	3	.42		
7	2	.28		
8	3	.42		
9	0	0		
10	0	0		
11	1	.14		
12	1	.14		
Total			119	16.69
Orthophoria	166	23.28	166	23.28
Not recorded	2	.28	2	.28
Total	715		715	

taking a single observation or by taking the average of a series of observations: this problem should be further investigated.

8. *External eye and fundus.* In 1940, 25 individuals were found to have some abnormality of the external eye or fundus: in 8 of these it was strabismus. At the 1940 and 1941 examinations there was a total of 16 cases of strabismus (1.5 percent of individuals examined): 14 of these were nonparalytic, 1 was of paralytic origin, and 1 was associated with the congenital absence of a muscle; 6 were diagnosed esotropia, 6 exotropia, 2 hyperesotropia, 1 exohypertropia, and 1 Duane's retraction syndrome. At the 1941 examination the 15 following conditions (2 percent) were also noted: hyperemic lid margins, 2; hyperemic conjunctivitis, 4; squamous blepharitis, 1; follicular conjunctivitis, 1; hyperemic bulbar and palpebral conjunctivitis, 1; chorioretinitis, inactive, 1; pigmented nevus, congenital, 1; pseudo-optic neuritis, 1; myopic conus, 1; hyperopic fundi, 1; healed chorioretinitis, 1. Two of these 15 would have been referred to an ophthalmologist on the basis of other findings, 11 were referred on the basis of these findings alone (1.5 percent of the 715 individuals), and 2 were not referred.

TABLE 4

DISTRIBUTION OF ESOPHORIA AND EXOPHORIA MEASUREMENTS AT NEAR (GRAEFE) IN MEMBERS OF THE 1941 GROUP

	No.	Percent	No.	Percent
Esophoria				
1	49	7.21		
2	23	3.38		
3	6	.88		
4	7	1.03		
5	1	.15		
6	3	.44		
7	1	.15		
8	2	.29		
11	1	.15		
12	1	.15		
Total			94	13.82
Orthophoria	215	31.62	215	31.62
Exophoria				
1	96	14.12		
2	149	21.91		
3	29	4.26		
4	42	6.18		
5	6	.88		
6	24	3.53		
7	5	.74		
8	6	.88		
9	2	.29		
10	8	1.18		
11	1	.15		
13	2	.29		
14	1	.15		
Total			371	54.56
Not recorded			35	4.90
Total			715	

9. *Recommendation.* In 1940 about 70 percent and in 1941 68 percent of the individuals examined were considered to have satisfactory vision and no further examination was advised. About 20 percent were advised to have a more thorough examination in both 1940 and 1941; about 10 percent in both 1940 and 1941 were advised to visit a specialist if symptoms referable to the eyes developed.

In 1940, 154 individuals (20.7 percent) were classified "refer" and 52 of these passed part I (normal visual acuity) of the Massachusetts vision test. The reasons for referring these 52 for a further examination were as follows: failure of part II (+1.50D. test) of the Massachusetts vision test, 28; failure of part III (Maddox rod), 7; because of symptoms of "eyestrain," 10; on the basis of the external and fundus examination, 6; and 1 because of the long interval which had elapsed since his very deficient vision had been carefully checked.

A future report[5] will suggest an adequate screening eye examination for use in adolescent groups and give findings based upon our experience with that method. The data given in this report have helped us in the development and selec-

tion of techniques for use in that examination.

Summary

1. Findings in various parts of an eye examination of a group of 1,009 preparatory school boys are given.

2. The data indicate the importance of adequate screening eye examinations as a part of any health program involving adolescents.

3. The desirability of including tests of hypermetropia and heterophoria as well as of visual acuity in any screening examination is shown.

4. Questions regarding blurred vision, red eyes, and headaches are best asked by a physician: the evaluation of such symptoms will not be helpful unless the history has been carefully taken.

5. There are at present no valid reasons for omitting annual eye tests even among children of the more privileged economic group.

6. The Snellen test is inadequate for the selection of all children in need of a careful eye examination.

7. The recommendation, on the basis of screening tests, for a further careful examination is better made by a physician after a consideration of all of the findings than by lay persons relying on set quantitative measurements alone.

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A VISUAL PHENOMENON RELATED TO BINOCULAR TRIPLOPIA*

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After undergoing operation for concomitant strabismus, patients frequently pass through a stage in which there is a rivalry between normal and anomalous correspondence. The innate, normal sensorial relationship is reawakened, but the anomalous relationship is not as yet completely suppressed. As a result, two directional localizations are attributed to the foveal stimulation of one eye. These two directional localizations are present, as a rule, only successively; at one time the foveal stimulus is localized in a normal, at another in an anomalous way. In certain cases, however, the normal and anomalous localizations occur simultaneously, and, as a result, the stimulus is localized at the same time in two different directions. This striking phenomenon is known as *monocular diplopia* or *binocular triplopia.* It is infrequently met with and can often be demonstrated for only a fleeting moment. In other cases it is found more or less constantly and can be observed in the same patient over a number of years.

Binocular triplopia is seen not only in the postoperative stage of concomitant strabismus; it may occur whenever there is a rivalry between normal and anomalous correspondence. This is the case with patients who have a facultative divergent strabismus. When these patients keep their eyes parallel for distance by an effort of convergence, they localize bifoveal stimuli in a normal way; when their eyes are dissociated, they localize these stimuli anomalously. It may happen that both modes of localization are present simultaneously and that the patient has binocular triplopia.

I have had the opportunity to observe a phenomenon related to this type of binocular triplopia. It is of sufficient interest to deserve to be reported.

CASE REPORT

A graduate student, aged 22 years, came for examination complaining of eyefatigue and headaches while doing close work. He has worn glasses since the age of eight years, at which time it was first noticed that his eyes had a tendency to turn out. He has worn glasses intermittently and is aware of which eye he uses, because of a difference in the size of the objects when looked at with the right and the left eye. He stated that for distance he uses the left eye and for near the right eye when he does not wear glasses; when wearing glasses, he uses the right eye for distance and near. He has never experienced diplopia.

His refraction showed a considerable anisometropia; with the right eye he saw 20/20 with a −5.50D. sph. ⌯ 1.00D. cyl. ax. 180°; with the left eye he saw 20/20−2 with a −0.25D. sph. ⌯ −0.25D. cyl. ax. 180°. Inspection of the eyes and ophthalmoscopic examination revealed no pathologic condition of the eyeballs.

Analysis of the neuromuscular apparatus disclosed the following findings: In the cover test the patient had, under refractive correction, an alternating divergent strabismus of 15 arc degrees for distance. There was no deficiency in the horizontal movements of either eye; if anything there was a slight excess of adduction in both eyes; in the extreme po-

* From the Clinical Division of the Dartmouth Eye Institute, Dartmouth Medical School.

sitions there was a jerky rotary nystagmus. Both inferior oblique muscles showed some overaction. The patient most of the time had binocular fixation for distance and his near point of convergence was excellent when he concentrated. In the double-image test[1] there was a crossed diplopia of 15 arc degrees when the patient fixated the light at the center of the Maddox cross with his left eye (*normal correspondence*) and an *uncrossed diplopia* of 15 arc degrees when he fixated with his right eye (*anomalous correspondence*). In the afterimage test[2] the *positive* afterimages were always localized *anomalously,* the *negative* afterimages were almost always localized *normally;* only rarely were the latter in an anomalous relative position. The double-image test and the afterimage test were repeated a number of times and the results were always the same.

Once, however, after considerable testing with the stereoscope had been done, the patient stated during a double-image test, while the red glass was in front of the left eye: "This is very strange. The red light is between the white light and the number one to the left. Yet the distance between the two lights seems much larger. It should be around number six or seven to the right."* This phenomenon could then be reproduced time and again when the red glass was in front of the left eye; it did not take place when the red glass was in front of the right eye. A few hours later the phenomenon took a somewhat different shape. When the red glass was in front of his left eye, the patient reported: "I see the red light at six or seven to the left, but the mental impression I get is that it is way to the right of zero." Again this did not occur when the red glass was in front of the right eye.

At the stereoscope, the patient at first had alternating uniocular vision, then diplopia, and finally binocular single vision. It took a considerable time until this stage was reached. He then had stereoscopic depth perception with the large Dahlfeld circles, but none with fine graduated cards such as the Keystone DB_6 chart.

Discussion

The salient features of this case can be summarized as follows: The patient has a very large anisometropia; he has an alternating divergent strabismus which has undoubtedly existed since early childhood, but which he is able to overcome by a convergence effort. He has been in the habit of keeping his eyes straight much of the time and as a consequence a particular sensorial condition has developed which can be observed frequently in cases of facultative divergent strabismus: When the eyes are associated, the retinal correspondence is normal; when the eyes are dissociated, the retinal correspondence is of an anomalous type. This is quite evident in this case from the afterimage test. In the darkened room, where there is no incentive for the patient to keep his eyes straight, the afterimages are always localized in an anomalous way, the angle of anomaly being equal to the angle of squint. In the lighted room the patient can, but does not always keep his eyes straight. Hence, the localization of the afterimages is alternately normal and anomalous.

The result of the afterimage test in this and similar cases must not be misconstrued as meaning that the localization of the afterimages depends upon the position of the eyes during the test. In the afterimage test the visual direction or directions of the two foveas are directly deter-

* The patient was seated at 2½ m. from the center of the Maddox cross so that the value of the large numbers referred to has to be multiplied by 2 in order to express the angular distance of the double images in arc degrees.

mined and they are independent of the relative position of the eyes. The localization of the afterimages has changed because of a change in the sensorial retinal relationship, which in this case is produced by the dissociation of the eyes.

Another interesting observation is the difference in localization in the double-image test, according to which eye the patient uses for fixation. The localization is normal when the patient fixates with his left eye and anomalous when he fixates with his right eye. It can be found relatively often in cases of unilateral strabismus that such a difference occurs with change in fixation.

In these cases normal correspondence can sometimes be elicited in the double-image test when fixation is shifted from the leading eye to the usually deviated eye. This phenomenon can be explained by the fact that anomalous correspondence represents an adaptation of the sensorial retinal relationship to the changed motor conditions. When the patient is placed under conditions of seeing that are unusual for him—for example, when he is forced to fixate with the eye which, as a rule, is deviated—the normal, innate retinal relationship may be reawakened. In alternating strabismus, in which the patient presumably uses or has used both eyes more or less equally, a change in retinal correspondence with change in fixation would not be expected. The patient under discussion does, in fact, prefer to use his right eye, at least when he wears his correction, although this eye has a much higher refractive error. It has, however, a slightly better visual acuity. This case cannot be classified, therefore, as a completely alternating one; some preference in fixation is given to the right eye.

The two phenomena which were discussed are interesting, but by no means unique. The singular feature in this case is the simultaneous presence in the double-image test of two modes of localization of biretinal stimuli which is akin to binocular triplopia. When the red glass is in front of the patient's left eye—the weaker eye, and only then—the patient sees the red light in a position indicating an anomalous localization. At the same time the simultaneous presence of a second visual direction, pertaining to the same stimulated element of the retina of the left eye, is evident from the patient's statement that there seems to be a much greater distance between the red and the white light and that, although the red light is to the left of the fixation light, it "ought to be way to the right" or "around 6 or 7 to the right." There is no actual monocular diplopia, but the phenomenon demonstrated by this highly intelligent and observing patient can be considered as a precursor to binocular triplopia.

4 Webster Avenue.

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NOTES, CASES, INSTRUMENTS

BILATERAL CONGENITAL COLOBOMA OF UPPER LIDS

CASE REPORT

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The congenital anomaly of the external eyes herewith presented is deemed of interest in the study of developmental ocular defects. No other case report of similar congenital malformation is noted in the literature.

The patient R. R., a Mexican boy, aged four years, was admitted on October 14, 1942, to the John Sealy Hospital because of a developmental defect of both upper eyelids.

No contact with the parents was possible under the circumstances. A social service worker who had been in the home was able to observe that no member of the immediate family was afflicted with any type of gross malformation of the external eye.

General examination. Systemic physical findings were essentially negative, although marked mental retardation was apparent; except for the eyes, no other congenitally anomalous condition was noted. Laboratory findings were all within normal limits.

Ocular examination. Both upper eyelids presented a similar coloboma, involving approximately one half of the entire width of the eyelid. Nasally, a caruncle of tissue was preserved in which the upper lacrimal puncta were present in both eyes. The lateral portion of both lids was apparently normal in structure; the lid margin of this portion contained a normal distribution of cilia. Action of the orbicularis oculi was deficient; in attempted closure lateral traction of the upper lid remnant was noted. During sleep it was observed that the inferior nasal quadrant of the cornea was exposed, more in the right eye than in the left. Both lower lids were considered to be normal in structure and function; weakness of the orbicularis, apparent in the upper lid, was not noted in either lower lid.

Fig. 1 (Potter). Bilateral congenital coloboma of the upper lids.

The conjunctiva of the right eye was injected and hyperplastic in the nasal portion, especially in the region of the upper nasal limbal area. The nasal half of the cornea was cloudy; in the central portion of this nebulous area a dense opacification was present which stained slightly with fluorescein. From this central scarred area a band of vascularized conjunctiva extended upward and nasally. The conjunctiva of the left eye was neither thickened nor unduly injected. Corneal abrasion and ulceration were absent in this eye; scarring consisted of a relatively thin corneal cloud located in the inferior nasal portion of the cornea. No pannus was present in this eye.

In both eyes relatively satisfactory examination of the anterior chamber was accomplished; in neither were the signs of previous or present iritis noted.

The lens, the vitreous, and the fundus were negative on ophthalmoscopic examination, with the exception of the finding of three diopters of myopia, each eye.

Extraocular movements could not be satisfactorily determined; no motor paralysis nor gross motor anomaly was present, although it was noted that nystagmus of horizontal-fixation type was present in all ocular positions.

Visual acuity could not be determined; retinoscopy revealed three diopters of myopia.

Discussion

Surgical correction of the defect described was accomplished by freeing the lateral palpebral ligament; tissue in the zygomatic region was undermined and the flap formed of the lateral portion of the lid united with the nasal flap. Postoperative cosmetic result was very satisfactory; healing of the corneal ulcer of the right eye was prompt. Position of the upper lids and lid motility following surgical correction were satisfactory.

In a description of the development of the eyelids Ida Mann[1] quotes from Prof. J. E. Fraser, stating that at the beginning of the second month the maxillary process, lying below the eye on each side, extends forward as far as the opening of the nasal pit, coming there into contact with the inner and outer nasal folds which form the boundaries of the opening. The maxillary process thus lies in contact, along the whole of its upper border, with the paraxial mesoderm encircling the eye and the primitive nose. The eye is embedded in this paraxial mesoderm. A projection below the eye, forming a shelf-like lower lid, is present at the 16-mm. stage. At this time a new epithelium-covered fold appears between the mesodermal brain fold and the eye. Growing downward this process produces a true lid, which begins to overlap the eye from above. In the 18-mm. embryo the upper lid has extended forward and backward to meet the developing lower lid and thus form the outer canthus. A new formation, developing from the mesoderm above, extends downward between the eye and the groove separating the nose and the brain. This process is formed of two portions, the first of which extends to the groove of the brain and the nose; the second grows down in front of the projecting eye, overlapping the underlying structures, and meeting the upper end of the maxillary growth in this region. During the ensuing period of growth elongation of the lids occurs, with the result that they gradually cover the projecting eye and meet over it. The growth is apparently more rapid toward the inner end, so that the lids begin to close from within outward at about the 32-mm. stage. As the margins meet, ectodermal fusion (adhesion) takes place between them. Fusion is complete at the 37-mm. stage and persists until shortly before birth. The formation of glands in the lids takes place while they are fused, and it is only after these formations are completed that cornification of the superficial cells in each lid margin leads to separation of the lids.

Colobomata of the upper eyelid, according to Ida Mann,[2] are characterized by a most usual occurrence at the junction of the inner and middle third of the upper lid. Typically, lashes and glandular structures are absent from the lid margin, and distribution of the defect is unilateral. Further developmental anomalies of the face are frequently noted, together with the appearance of dermoid growths of the canthus.

In explanation of the probable developmental etiology of this type of defect Ida Mann has commented that clefts are never observed in normal lids, nor is the lid ever noted to be adherent to the eye, and for this reason colobomatous-type defects cannot be classified as germinal in origin or as being due to localized arrest in growth. Evidence of inflammatory proc-

ess is invariably absent. It is noted that the majority have every appearance of being malformations depending upon some factor of mechanical character. The view of Seefelder is quoted by Ida Mann; the suggestion is made that in the occurrence of triangular lid defection there has been a failure of adhesion of the upper-lid and the lower-lid folds, or a premature breaking down of the adhesion. Differentiation of lashes and lid-margin structures occurs only during the period of adhesion, and failure of such structures to develop correlates well with the suspected failure of the lid-margin adhesion to occur. The gap itself is described as a lag in growth, possibly due to the absence of the pull of the adhesion. The older theory that notches in the lids are the remains of the facial cleft is untenable, first, because the facial cleft does not involve the eyelids, and, second, because two defects are frequently noted in one lid.

816 Strand.

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WATER BATH FOR MAINTAINING PROPER TEMPERATURE OF EYE-IRRIGATION SOLUTIONS

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A warmer to keep a small amount of stock irrigating solution warm for treatment purposes renders irrigation of the eyes so consistently pleasing to the patient, because the temperature is exactly right at all times, that it is well worth the initial cost. The author has had two such pieces of apparatus in service for 6 and 15 years, respectively. The apparatus is so troublefree and satisfactory that it was thought worthwhile to describe it.

The essential part of the apparatus is a thermostatically controlled water bath, two types of which can be used, and a rack to hold the bottles.

1. A water bath, such as the one illustrated* (figs. 1 and 2), measuring 4½″ by 9″ by 4″ deep (inside dimensions)

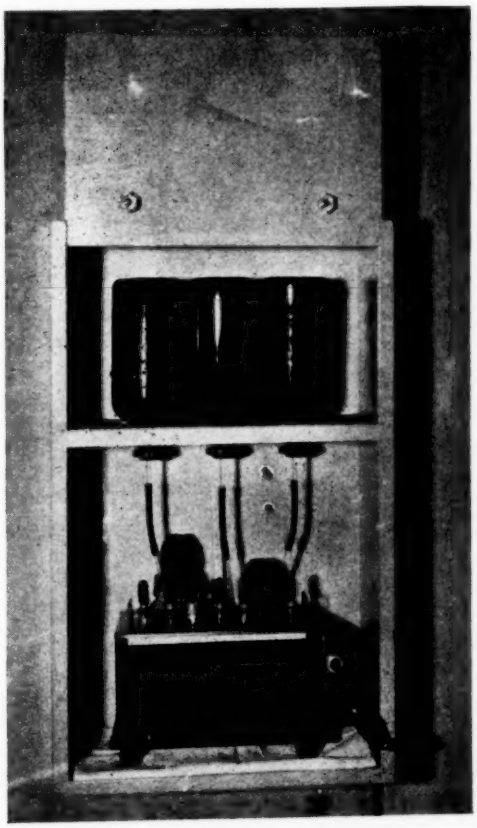


Fig. 1 (Hughes). Photograph of apparatus.

*Obtainable from Eimer and Amend, 633 Greenwich Street, New York, New York.

has a built-in thermostat and heating element. A tinsmith can make a stand to hold Ziegler jars and six or seven small dropper bottles so that they will be two thirds immersed.

The rack (fig. 3) used by the author has 11 holes in the top layer, which fits flush

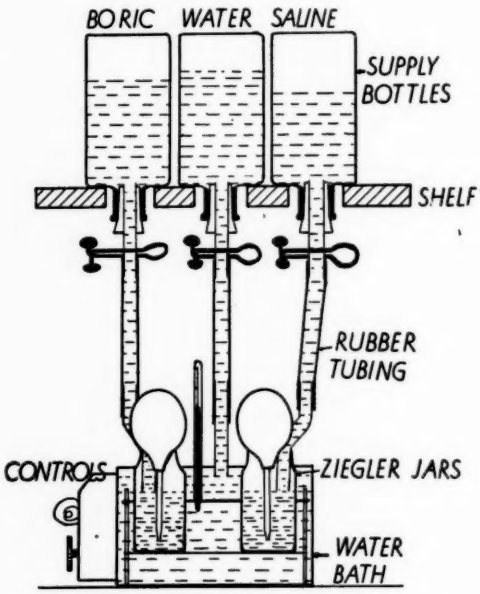


Fig. 2 (Hughes). Diagram of apparatus.

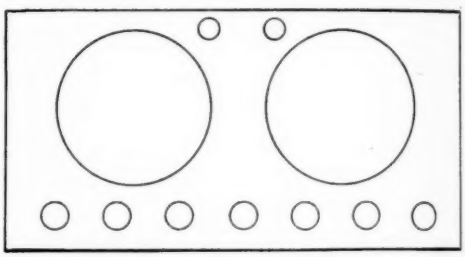
with the level of the top of the water bath: (a) for Ziegler jars (3 inches across), two; (b) for two-dram dropper bottles (⅝″ across) in front of the above mentioned openings, seven; (c) hole for a thermometer (small hole in shelf below to hold the thermometer off the bottom, one; (d) hole for the tube from the water-supply bottle above to keep the water in the bath at the proper level, one; (e) an extra hole or two for culture tubes is easily added.

There are shelves below the top layer which are placed at different levels, one for the Ziegler jars and a second one with small holes placed under the holes for the dropper bottles so that they are held in the upright position. A second layer with holes the same size as those in the top is placed midway between these two layers to keep the bottles from floating away when they are nearly empty.

2. A rack can be made to fit any dish deep enough to contain sufficient water partially to immerse two Ziegler jars, a thermometer, and a thermostatic switch with a heating element such as the type used to maintain proper temperature in a tropical-fish tank, obtainable from any tropical-fish supply store.

In either case the switch is adjusted to maintain a temperature of 40°C.

A shelf with three holes, 1½″ in diameter, 4″ apart is placed above the water bath to hold three large 16-oz. supply bottles turned upside down (fig. 2). Through the cork of these bottles is passed a short piece of glass tubing and a second piece at the other end of a piece of rubber tubing. The glass and rubber tubing must be of sufficient diameter (0.25″, 6 mm.) so the fluids will pass down and air will



PLAN OF HOLES FOR ZIEGLER JARS AND DROPPER BOTTLES

Fig. 3 (Hughes). Diagram of rack for holding bottles and Ziegler jars.

be admitted to the bottles through the same tube. These are made sufficiently long so the fluid in the Ziegler jars and in the water bath will be maintained at the desired level. If desired, a two-holed stopper and two tubes may be used from the supply bottles, passing down to the solution jars in the water bath, in which case the rubber and glass tubing may be of smaller diameter. One of these tubes

will go to the top of the solution in the supply bottle when it is inverted, to let air in when the fluid level in the jar below permits, and the other just passes through the stopper. It goes to the bottom of the fluid in the jar. A spring clamp on the rubber tube is used to prevent spilling the fluid when changing the supply bottles. It is stored on the glass section near the supply-bottle stopper when in use so that it does not obstruct the automatic flow of the fluid.

With either of these arrangements the fluid in the jar is automatically replenished from the supply bottle above, as it is used for irrigating the eye. The supply bottle above is large enough to hold a supply for several days, and the reserve amount may be seen at a glance. The water in the bath is kept at the proper level in the same manner.

It is the hope of the author that this apparatus will be found sufficiently useful to warrant this report.

131 Fulton Avenue.

SOCIETY PROCEEDINGS

EDITED BY DR. RALPH H. MILLER

COLORADO OPHTHALMOLOGICAL SOCIETY

March 9, 1942

DR. WILLIAM H. CRISP, *presiding*

SOME NOTES ON OPHTHALMIC BACTERIOLOGY

DR. RICHARD THOMPSON, Professor of Bacteriology at the University of Colorado, spoke on this subject.

UNUSUAL LESION IN THE MACULA

DR. WILLIAM BANE presented the case of a Negress, Mrs. W., aged 38 years, who gave a history of poor vision in the right eye for the past several years. There was no history of injury. She suffered no pain nor discomfort. She had worn glasses for the past seven years and the last change of lenses was made in 1930. She complained of being able to see only one letter at a time with the right eye. The vision without glasses was R.E. 20/40, L.E. 20/20. The pupils reacted normally to light and accommodation. The tension was 20 mm. Hg (Schiötz) in each eye. Ophthalmoscopic examination revealed deep cupping of the optic nerves and a mottling of the macula in the right eye. The vessels passed through the scleral rim of the optic nerve as they entered and left the eye. Remainder of the examination was negative. Central fields of vision were normal for the left eye, but in the right eye a horizontal scotoma was found. The scotoma included the blind spot and extended 20 degrees to the nasal side of the vertical plane and 15 degrees below the horizontal plane. Refraction improved the vision in the right eye to 20/20, one letter at a time; and the left eye to 20/15.

BUPHTHALMOS

DR. RALPH DANIELSON presented the case of L. N., a boy, aged 15 years. History revealed that his birth was normal, full term. He had had the usual childhood diseases, all of these after the onset of the eye trouble. There was no family history of eye trouble. When the patient was 3½ months old, his mother noticed that the pupil of the right eye was covered with a white film, followed by the same condition in the left eye one week later. It was at this time that medical advice was

sought. On November 5, 1927, under a general anesthetic the tension in each eye measured 50 mm. Hg (Schiötz) and was not improved by the use of miotics. In February, 1928, a bilateral iridencleisis was performed. The vision in November, 1928, sufficed to see large objects, unimproved with lenses. In May, 1931, the pupil of the left eye was yellow and the eye had become soft. Enucleation of the left eye was done in July, 1931, and a gold sphere was implanted which came out a year later. The tension of the right eye remained from 35 mm. to 45 mm. Hg (Schiötz) even under miotics. The general health of the patient had remained good until 1941 when he developed spinal trouble. X-ray studies revealed a tuberculous condition which was no longer in a progressive stage. This case of buphthalmos was presented to determine the advisability of surgery.

Retinitis pigmentosa

Dr. Henry Liebenberg presented the case of L. C., a man, aged 51 years, who was seen in the clinic in October, 1938. He gave a history of poor vision and night blindness with gradual progression since childhood. There had been similar blindness in five generations of the family. The vision in each eye was less than 2/200. External examination of the eyes was negative. The lenses showed anterior polar and posterior cortical opacities. Fundus examination revealed peripheral pigmentary deposits, bone corpuscular in shape. The patient was seen again in February, 1940. He had had a cataract extraction of the right eye and the vision was improved to 10/200. The fields of vision taken at this time showed a general constriction to about one half the normal size. The rest of the examination showed the same findings as previously. The patient was seen again in March, 1942, with no further change in his condition.

A case of multiple external lesions

Dr. Joseph Tschetter presented the case of J. W., a man, aged 70 years, who complained of lacrimation and redness of the eyes. Vision was 20/15, each eye, without correction. Tension was 15 mm. Hg (Schiötz) each eye. Examination revealed a senile ectropion, each eye, with eversion of the lower puncta and hypertrophy of the conjunctiva. A chalazion was present in the upper lid of the right eye near the outer canthus. Small pterygia were present at the nasal limbus of the cornea in each eye. Ophthalmoscopic examination revealed large floaters in the vitreous and retinal arteriosclerosis. This case was presented for the multiple external conditions present and their order of treatment.

Harry W. Shankel,
Secretary.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

April 6, 1942

Dr. James W. Smith, *presiding*

Symposium on industrial ophthalmology in war effort

Suggestions on first-aid in eye injuries—a measure of civilian defense

Dr. Percy Fridenberg stated that first-aid is not treatment. It consists essentially in relief of pain, protection of injured parts, prevention of infection, and immediate transfer of injured to bases where appropriate medical or surgical procedures can be instituted. This is of prime importance in eye-injury cases. Foreign bodies, burns, and wounds of the conjunctiva, cornea, and lids will be the usual traumatisms. Irrigation, flushing out the conjunctiva, instillation of

butyn or novocaine, a sterile dressing will suffice, temporarily. Records should be kept and identification tags attached to the patient. The first-aid kit of the "ambulant" aider needs only a few things for the aforementioned procedures. Posts and stations will, of course, require more; for example, sterile solutions, towels, instruments, a good heat and light source, a good nurse.

A MORE REALISTIC OPHTHALMIC SERVICE IN INDUSTRY

DR. ALBERT C. SNELL stated that the need for a more realistic ophthalmic service in industry originates from the three following situations: First, the demands made on vision by modern industry; second, the need to employ such degrees and qualities of vision as employees possess and can use effectively; third, the need for adequate ophthalmic service. Increased production means increased demands on vision. Correction of visual defects, which are found to average about 15 percent among industrial employees, is necessary to increase visual efficiency. After correction, efficiency has been found to increase production by 5 percent.

Many visual defects cannot be corrected to bring about perfect visual function. There are probably 400,000 employees in this class.

There is need for a more realistic ophthalmic service; first, protective; second, new technique in discovering visual defects; and, third, a more convenient method of examining and supplying proper treatment or correcting lenses. There should be more well-balanced medical staffs in industry. Such staffs should include an ophthalmologist, either part-time or as consultant.

The responsibility for a more adequate ophthalmic service rests with management, labor, and medical staffs (including a coöperating ophthalmologist). All these groups have a responsibility in any program of detection, protection, and correction of the vision of industrial employees.

Discussion. Dr. Elbert S. Sherman said that there was a great laxity in the prevention of eye injuries. Many plants have no compulsory rules concerning the wearing of goggles, and in many it is not enforced. He agreed that 90 percent of eye injuries that come to the office as a result of accidents could be prevented by the wearing of goggles. There is a great need for more strict regulations in small plants and also, in many instances, in large plants. He cited the case of a man who was struck by a "slug" of steel. It penetrated the cornea, tore the iris, injured the lens, and entered the vitreous. It was removed without difficulty. The eye was saved but there was very little vision. Before the man went back to work he was asked if he was not required to wear goggles and he replied "nothing ever happens." This man wore goggles when he returned to work.

Dr. Sherman endorsed Dr. Snell's very practical definition of "good vision" which is "that degree of visual functional ability which is adequate for the performance of the visual task presented." This should be printed in large type, framed, and hung in the office of every employment manager. The common unreasoning practice of adhering to an arbitrary, inflexible standard of visual acuity, without consideration of other factors, for all applicants for employment is unfair to both the employer and the prospective employee. It may fail to reveal other, possibly serious, visual defects, and, on the other hand, the employer is often deprived of the services of a worker well qualified for many types of employment. Fortunately the defect, in many cases, can be remedied

with glasses or by other means. Many cannot be helped.

Particularly distressing is the plight of the young person (there are thousands of them) with congenital amblyopia, who has just applied for his first job and been rejected. He is able and eager to work and comes to the ophthalmologist for help and finds that he is up against a stone wall. At his age not much can be done for an amblyopic eye. These cases emphasize the need for more pre-school examinations of eyes. Most of these cases when discovered early in life can be helped.

How to deal with the problem presented by these and other one-eyed individuals is an important question. The legislative method suggested by Dr. Snell sounds practical and should be followed up. In New Jersey the liability of an employer of a one-eyed worker who loses his remaining eye is limited to compensation for the loss of one eye. Further compensation for the resulting total permanent disability is taken care of by a revolving fund made up of assessments on insurance carriers and self-insured employers, and administered by the Labor Bureau. In spite of this, employers are very reluctant to employ a one-eyed man. This is a very important social and economic problem. Experience has shown that the individual who has always had only one useful eye is as efficient in many types of work as one with binocular vision.

It would seem that Dr. Snell puts too large a share of the responsibility for an inadequate ophthalmic service in industry on the ophthalmologist. No progress can be made until industrial managers are educated to realize the need and value of such service. This will be a slow process. It has taken many years of educational effort by the National Society for the Prevention of Blindness, the National Safety Council, and other agencies and individuals to bring about partially effective action for the prevention of eye accidents. Many managers, especially in small plants, are still in the kindergarten. One sight-saving rule most of them have learned, often by expensive experience; that is, the importance of prompt treatment of an injured eye by an ophthalmologist.

Dr. Snell, in closing, said that the A.M.A. has a Council on Industrial Health which is very active and welcomes suggestions. It hopes to bridge the gap between the need for service and the man who can give it. He said that there was a great need for adequate medical staffs. There is no instance in which such a staff has not proved its worth, and this would have to be pointed out to management.

The problem of faulty stereopsis in industry (a preliminary report of certain operations in the publishing field)

Dr. Laurance D. Redway stated that employees who handle and file metal stencils by the millions are often inaccurate in their work and must daily read intaglio characters on the back side of these "metal mirrors." They are subject to eye fatigue and nervous symptoms of a vague character. Many of them are women, frequently absent from work because of headache and "nervous upsets." The stencils because of the zero contrast of the depressed characters, and the brightness of the metal, presented a problem which has been mechanically solved by filling the depressed characters with black quick-drying ink. Satisfactory contrast has been achieved.

A survey of illumination found this inadequate. Experiment with fluorescent lighting of an intensity of 65 foot-candles proved to be nonfatiguing and is psychologically acceptable. Errors in filing continued to occur, however, although headaches, eye strain, and "nervous up-

sets" seem to have decreased.

Employees were examined for visual defects, muscle imbalance, and faulty stereopsis. About 2 percent were found to have complete absence of this function in a group of 281 examined. Found deficient in some degree were 19.2 percent.

Stencil filing requires a high degree of accuracy of vision, binocular function, depth perception together with rapid ocular and manual coöperation and equilibration. The operation is almost ideal for the study of the effect of faulty stereopsis or the absence thereof as an occupational handicap-hazard. Further studies under rigidly controlled conditions are contemplated.

Respecting faulty stereopsis, if 25,000,000 people are employed in industry, and if 2 percent may reasonably and conservatively be said to have deficient depth perception, it would be a characteristic of some 500,000 persons. Such a large group deserves further study to determine the relationship of the handicap hazard of faulty stereopsis to specific high-speed operations in industry in its causal relation to accidents, errors, and nervous disorders.

Discussion. Dr. Morris Davidson said that industrial ophthalmology is not concerned solely with the treatment of eye injuries. The relationship between the job that is being done and the bigger job should be borne in mind. There are about 4,000 injuries annually in New York City. This number is likely to be doubled or tripled by the end of this year. The ophthalmologists must be prepared not only to handle these increased cases but also to help prevent them, and to supply eye care that is badly needed. He suggested that when handling eye injuries, there is no reason why a prescription for glasses should not be given to the patient if necessary. The refraction has already been done in the course of examination.

As to stereopsis, he believed it at least second in importance to visual acuity. He might even say it is equally important. Twenty percent of the people have defective vision—of course not all serious, not correctible by glasses, in accordance with a survey, in 1939, of the eye material examined for compensation purposes—and 2½ percent of the whole population suffer from a lack of stereopsis. Obviously, stereopsis is a very important item in any eye examination. It is necessary to get away from the feeling that it is important only in squinters and orthoptic training. It is important in many other cases. It is often absent in high anisometropia, minor ophthalmoplegia, and heterophoria. He has seen it absent after operation for detached retina, in blepharospasm—whether it was the cause or effect, he did not know—and in aniseikonia. Dr. Redway's figure of 2½ percent of his material with an absence of stereopsis coincided with his own findings in his 1939 survey and is probably the correct figure. Probably 10 percent more have faulty stereopsis. In cases of minor squint it is sometimes lacking in near vision and not in distance or vice versa. This cannot be determined unless the examination is made for distance and near. As to the instruments, stereopsis can be just as accurately measured as visual acuity. Until World War I there was little concern about it because man was largely a terrestrial animal. Since the extension of aviation, however, a great deal of work has been done and devices suggested by Howard, Dolman, by Pulfrich, who brought out stereoscopic cards, by Martin Cohen, by Conrad Berens, and by the speaker. It does not matter much what instrument is used, but the examination for stereopsis should be made a routine part of the examination in every eye case.

Dr. Ralph I. Lloyd said it was the first time at an eye meeting that he had heard reference to the fact that a patient does

not necessarily use both eyes for both distance and near. He became interested in this question many years ago and found that 20 percent of a group of 300 office workers did not have binocular vision for both distance and near. The determination of this function for both near and far should be a part of every eye examination.

Dr. Ernst L. Metzger stated that for many mechanical jobs binocular vision and stereopsis should be tested not only in the examination room but also at the place where the work is actually performed. It was very revealing to see how the working conditions improve with the elimination of glare and the proper intensity and wave length of the illumination. The advantage of the fluorescent light, for instance, is obvious in Dr. Redway's cases, where the objects were stationary. Where we deal with moving objects the stroboscopic effect may cause serious trouble and lead to early fatigue. The color of the illumination is important because the chromatic aberration of the human eye affects the accommodation, the convergence, and the following of fast-moving objects with the eyes far more than one generally expects. The colors of short wave lengths are focused in the emmetropic eye in front of the retina, whereas the red end of the spectrum is focused behind it. The resting emmetropic eye is focused for parallel beams of the yellow region of the spectral band. In mixed (white) light the chromatic aberration is an error only in a physical optical sense; biologically it must be considered as a valuable aid for the accommodation and stereoscopic vision. The influence of colors upon posture and muscle tonus—not only of the eye muscles—which has been established in laboratory experiments, could easily be utilized in the selection of adequate illumination for special technical requirements.

The ability to see stereoscopically is not constant even with the same individual. It changes considerably within the duration of one working day. It may improve during the first few hours on account of training and certainly will decline or even get lost in some people toward the end of the day on account of fatigue.

These are only a few of the numerous factors requiring careful consideration in ophthalmologic job analysis. They may help to find a more biologic basis for the relation of working time and relaxation in peace time and war industry.

Dr. James W. Smith asked Dr. Davidson to explain how the scheduled loss is computed in workmen's compensation cases when stereopsis is impaired following eye or head injuries.

Dr. Davidson said the compensation is computed on the basis of the result of examination of the motor field. Only that part of the field which is lost is compensated for. Total absence of stereopsis is equivalent to loss of an eye. If there is an ophthalmoplegia of one elevator, there is a loss of stereopsis only in the field of that muscle. The lower half of the field is considered of greater importance than the upper, and compensation for its loss is twice that of the loss of the upper field.

Dr. Laurance D. Redway in closing said that fluorescent light contained a high percentage of blue, which would fulfill the requirements of which Dr. Metzger spoke.

He said that the laxity in prevention of accidents was not always on the part of management. In a few plants where the lighting was admittedly bad, if a doctor came into the plant with instruments or made suggestions, he engendered suspicion on the part of the employees. They were suspicious of what he was doing and considered him the agent of the management. In such instances the work had

to be done in a more circuitous way.

As far as he knew, no other investigations in connection with metal stencils had been done. He would be glad to hear of them, if they had.

Industrial Ophthalmology from the Standpoint of Industrial Hygiene

Dr. Leonard Greenburg stated that from the public-health viewpoint, there are essentially five elements in the program for eyesight conservation. These are: 1. Preventive medical care. Greater emphasis is needed here especially in the prevention of syphilis, glaucoma, and other diseases which directly and indirectly contribute to blindness. 2. More eye examinations. These should begin at a younger age than at present and continue past middle life at frequent intervals. In addition, the necessary medical and refractive care which these examinations disclose should be given. 3. Better seeing conditions. Many work throughout life under conditions of artificial illumination not conducive to the preservation of eyesight. There must be a continuing campaign for more adequate and satisfactory illumination in the home, workshop, at play. 4. Control of accidental eye injuries. The campaign for the control of accidental eye injuries has hardly been touched in this country. In the home, at play, and in industry it is imperative that blindness be prevented on a wide scale. 5. Mass educational program. Over and above the aforementioned four elements in the picture there is required a mass educational program from pre-school to late adult life, covering all phases of the problem. Dr. Greenburg made a plea for a designed program along these lines.

Discussion. Mrs. Eleanor Brown Merrill, Executive Director of the National Society for the Prevention of Blindness, emphasized the need for more complete statistical data. Responsibility for prevention rests with management, labor, medical, nursing, and safety personnel, and with the employees.

Mrs. Merrill referred to the survey of a group of 34 concerns, mentioned by Dr. Snell. Eye safety was found to be given relatively little attention. Few provided for examining the eyes of employees or took into account the part which "seeing" conditions might play in relation to every type of accident. Following this survey, the National Society for the Prevention of Blindness is extending its educational program in this field. The sale of Louis Resnick's book, "Eye hazards in industry," is being promoted; from it a brief digest has been prepared for distribution to safety engineers in training under the auspices of the National Committee for the Conservation of Manpower in War Industries; a primer is in preparation for management because the responsibility rests largely with management, which must be shown the need and the opportunity for safe and economic practice.

During recent months there has been an increase in industrial accidents, and further increases may be expected under pressure of the growing production program. According to the American Social Hygiene Association, there has been an increase of venereal disease in industrial areas, and those concerned with prevention of blindness realize the significance of this to ocular health. The Association has studies under way in a Kentucky mining area and in a California aircraft-production area which should provide material of value for education of workers, their families, and the general public. In this connection it is worth noting that one large company in another state has asked the assistance of the National Society for the Prevention of Blindness in preparing a pamphlet for distribution to its workers, which will not only discuss industrial safety but will include

information on eye care in the home and at various age levels. Thus the family can be educated through the industrial approach. Many similar moves could be taken.

In closing, Mrs. Merrill referred to a poster she had recently seen carrying the slogan, "Every accident is a blow to safety." The educational program should emphasize the fact that time lost in accidents means slowing up of defense activities, as well as added danger and general decrease in efficiency.

Miss Grace S. Harper, Director, New York State Department of Social Welfare for the Blind, pointed out that under the educational laws records of eye tests and eye examinations should be available at the time that students leave the public schools, including vocational, trade, and technical schools. She said that if the educational laws were more adequately carried out, much of the information needed should be transferable to industrial management. Also that for younger applicants for employment the work permits issued by the Department of Education must include a description of the physical disability of the minor and state the specific occupations in which the minor may engage.

Dr. Percy Fridenberg said that the spoken word was better than the pamphlet and suggested that the educational program for the prevention of eye injuries might be aided if all the first-aid teachers, who have contact with many people, were instructed to speak for a few moments on this subject, pointing out that first aid is the last step and not the first. They could stress the need for periodic eye examinations and the prevention of accidents in the home.

Dr. Adolf Posner emphasized the points made by Dr. Snell; namely, that the man should be fit for the job and the importance of the examination. He cited two cases. The first case was that of a man, 60 years of age, who for many years had worked in a boat yard which he owned. He wanted to get a job in another boat yard. He had incipient cataract with vision of 20/70. He was required to have 20/40. The foreman was particularly anxious to hire him as he was well qualified for the job. The central part of the lens was clear. Pilocarpine was given. He passed the visual test and now both he and the foreman are happy. The second case was that of a patient with keratoconus, with 20/400 as the best corrected vision. Ten years ago a New York oculist gave him the old spherical Zeiss contact lenses. He has not been able to wear them but he puts them on for the civil service examination. He has taken 24 examinations and passed all of them.

Dr. Leonard Greenburg was very much interested in Miss Harper's suggestion and felt that it should be followed and receive full consideration. The educational program, he pointed out, is a very large task in itself. Much has been done in the preventive field, but much more remains to be done. Many companies, the outstanding one being the Pullman Car & Manufacturing Company, have very few eye accidents, but there are many others which should employ the compulsory-goggle program.

He was interested in Dr. Posner's cases and cited one of a highly skilled gear shaper who was offered another and better job in a war industry at a salary of approximately $125.00 a week. He failed to pass the eye examination because of defective vision in one eye and in spite of the fact that he had been at the same job and had been successful for many years the plant doctor would not employ him because of his visual defect.

Sidney A. Fox,
Secretary.

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THE WAGNER BILL

Perhaps by the time that this number of the Journal goes to press action will have been taken on Senate Bill No. S1161, known as the Wagner Bill, now before Congress. It may not, however, be too late to make editorial comment about it.

In this issue there are two articles that deal with subjects directly related to those covered in the Wagner Bill; namely, the editorial on "Communistic rumblings" and the review of De Kruit's book, "Kaiser wakes the doctors." In brief, this bill proposes placing in the hands of one man—the Surgeon General of the Public Health Service—the power and authority (1) to hire doctors—possibly all doctors—at fixed salaries to provide medical service; (2) To designate which doctors can be specialists; (3) To determine the number of individuals for whom any physician may provide service; (4) To determine arbitrarily what hospitals or clinics may provide service for patients. It instructs the Surgeon General to provide general and special medical care, laboratory tests, and hospitalization for all beneficiaries of the Social Security Act and their dependents—estimated at 110,000,000 people. This bill also provides for placing in the hands of the Surgeon General of Public Health Service three billion dollars to meet the expense of this

medical care. Space will not permit details of the plan, but it must be obvious that, if passed, the medical care of the people of America will for the most part be under Federal direction.

The methods of handling the health of our people have been under fire for many years; perhaps at no time more than at present. Even the most ardent advocate of the current system must admit that it often falls far short of giving maximum medical care to a certain section of the people.

It is perhaps an unfortunate fact that the rapid growth of America has tended to exalt the value of money often to the disparagement of finer things. Every man wants to have for himself and to provide for his dependents the best in schooling, housing, food, and clothing that can be had. His success in life is too generally measured by the appearance that his physical properties present. The physician has not been unaffected by this trend—probably the altruism of our fathers has been somewhat dimmed in us by this change; we tend to forget that the fundamental purpose of the healing art is the helping of others. The medical care that is best for the people and not necessarily the most remunerative for the physician is that which he must sponsor.

The income tax with all its disagreeable features may prove the leavener; it is now, and in our generation and probably that of our children will continue to be, impossible to keep for oneself anything above a modest income. This may in the long run prove helpful to medical practice. It may cause the physician to be more willing to direct his activities into the less remunerative channels; it may divert his interest from rich patients—in the first place, there will not be rich patients, and, in the second place, no matter how large an income he might derive from them he would not be able to retain it.

However, regardless of what change shall be made in the administration of medical care, one thing is certain, and that is that to have this completely under the control of the Government, with the physician having no voice in it, will not be of the greatest advantage to the patient and will surely work a serious detriment to the physician. Doctors must agree on this point no matter how much they may disagree on other phases of the people's care. Undoubtedly in the immediate future the doctors of America must actively and personally take action on the economics of medical care, or the matter will be taken out of their hands. If they continue to leave this to a few representatives who may not truly represent their thoughts, Government or State control appears inevitable. The action that must be taken *now* is to write to your representatives in Congress that you regard the Wagner Bill as pernicious and urge them to vote against it.

Lawrence T. Post.

COMMUNISTIC RUMBLINGS

In the development of social and political reorganization few will dispute that evolution is distinctly to be preferred to revolution. Not infrequently, reform measures are found to have been adopted without adequate understanding as to the results which might be expected. Mistakes have to be corrected in the light of experience. The sum total of human happiness and efficiency is likely to be greater, and the shocks and disasters arising from misjudgment may be expected to be less formidable, if change proceeds gradually than if it occurs with explosive and overwhelming force.

Yet revolutions, more or less violent

and explosive in character, are often rendered inevitable by the obstinate and misguided resistance of vested interests to the pent-up forces of progress. Unfortunately, sweeping change sometimes does as much harm as good, at least for the time being, even though the final accounting may show gain rather than loss. False steps made on a heroic scale may be later corrected, but in the meantime great harm may have been done to large sections of the population, or even to the social and economic structure.

In the name of freedom and justice, the forces unleashed by the French Revolution perpetrated much that was unjust and tyrannical. History will probably make the same criticism of the Communist revolution in Russia. Happily, the Russian movement can take credit for many contributions to progress, not merely in Russia, but throughout the world.

Sociologically speaking, the rank of any nation in the scale of development may be estimated according to the educational condition of its population. General progress is impossible in the presence of wide-spread illiteracy. A printing press accessible to every citizen will go far to make stagnation impossible.

The development of medical knowledge and the efficiency of medical care are also broadly parallel with the educational status of the people. Among the world's most important masses of population, India and China still show a grievous preponderance of illiteracy. In each of these two countries the great majority of the inhabitants are practically without medical care, except so far as it is provided through the traditional knowledge and skill of the primitive citizen.

Twenty-five years ago, the Soviet Socialist Republic, heir to the weaknesses of the Czarist régime, had a population of whom 70 percent were illiterate. At that time, Russia had something like 24,000 physicians. Shortly before Hitler's invasion of Russia, the number of physicians in that country was put at 170,000;* and we are told that in the present war this body of fully trained physicians is supplemented by 500,000 so-called "Feldshers" (a sort of surgical helper), less completely trained in medicine, and about one half of whom are women. In the same period, partially through adult education, the percentage of illiterates among the Russian population has been reduced to less than ten.

In backward countries, it is obvious that retardation as to elementary education, and inefficiency in regard to the provision of medical service, could hardly be overcome in a short period without bureaucratic interference. The slow processes of natural development, alike as to literacy and as regards provision and acceptance of medical care, would have been quite inadequate to bring the Soviet Socialist Republic to its present relatively high level in both relationships. In the large centers of population the Russian government has found it necessary to establish a type of medical organization such as would be viewed with alarm by the physicians of the United States.

Although a certain amount of private practice is permitted, we are told that almost all Russian physicians are employed by the Soviet government. The greatest emphasis is laid upon preventive medicine and hygiene, and the care of mother and child. There are many rest homes and sanitaria for Russian soldiers and workers and their families, a number of these structures having formerly been palaces belonging to the royalty and nobility. We are assured that medical stand-

* A recent article by Rubenstein (California and Western Medicine, 1943, July) puts the number of physicians at 200,000.

ards have been improved during and in spite of the war. When the capture of Moscow was threatened by the Germans, medical students and teachers were evacuated to the rear, along with other scientific and educational organizations.

Another interesting example of governmental intervention concerning medical service in a medically backward country is to be found in Mexico (see Michael Scully, Pan-American Magazine, 1943, February). In the year 1936 a survey disclosed that of Mexico's seventeen or eighteen million inhabitants twelve million were without any sort of modern medical care. The conclusion was reached that Mexico needed 18,000 physicians, whereas it had only 4,500, 90 percent of whom practiced in the larger cities.

Under the guidance of Gustavo Baz, Dean of the Faculty of Medicine of the National University, vigorous measures were initiated. In the first place, 260 senior students of the medical department were made "provisionally" Doctors of Medicine, and were given (during their vacation period) the task of introducing the indispensable rudiments of public health, that of teaching hygiene, and that of collecting facts and statistics concerning life in the rural areas.

One of these enthusiastic young undergraduates was killed by superstitious Indians who had refused to accept his modern treatment of a case of diphtheria. Eleven were attacked by Indians but escaped serious harm. In several instances, troops had to be sent for protection of physicians and nurses.

The valuable information obtained through these youthful missionaries of Æsculapius resulted in an important further step. It was believed necessary to provide ultimately 12,000 more physicians for the care of new regional hospitals and ambulatory services. In 1937, therefore, President Cardenas approved a new plan. Each year, an important number of the best graduates of the preliminary scientific course are enrolled in the newly inaugurated School of Rural Medicine. The expenses of these students are borne by the state. After graduation from the School of Rural Medicine they must serve at least five years in the Rural Medical Service of Mexico. The course of training devotes special attention to tropical diseases, and includes obligatory studies in dentistry and veterinary medicine. It is hoped ultimately to draw a steadily increasing number of such students from the youth of the Indian villages, so that they may return to practice among their own people.

The physician of the United States is ordinarily an inveterate individualist, with a great fear and dislike of regimentation. He desires to serve the public in his particular way. He is not afraid to work, but he likes to preserve the feeling that he is his own master and can practice medicine when, where, and how he pleases, without state control. He frequently derides and despises what is known as contract practice.

Yet he has seen his activities more and more limited by municipal and privately endowed activity in the provision of medical facilities. When he becomes a part of such municipal or charitable undertakings he usually shows a somewhat surprising willingness to serve without pay, apparently feeling that only thus can he maintain on the one hand an adequate body of experience and on the other hand a sufficient reputation among the community. He is apt to flatter himself that these services are performed in a spirit of altruism. But he commonly harbors a more or less vague idea that he is reimbursed for such services by the scale of fees which he is able to levy from most of his private patients, and especially from the more prosperous among them.

There is a good deal of support, both in experience and in a knowledge of human nature, for the belief that medical care rendered by the physician as a state employee would prove less efficient than private practice. Few will deny that professional obligation to the individual patient affords the highest type of medical care. Many unpleasant details about the English panel system have been recorded, and even worse statements have been made regarding the German Krankenkassen.

Generally speaking, the population of the United States no doubt fares better as to medical care than any other population in the world, in spite of a recent statement that "the medical scientists of Russia are being given better opportunity to produce good work than in any other country . . . Their conditions of work are well nigh ideal." There is perhaps in this country less excuse than anywhere in the world for a system of state medicine, with its tendency to bureaucratic red tape and weakening of the sense of individual responsibility.

The provisions of the Wagner bill which deal with the organization of state medical care will no doubt be opposed to the bitter end by organized medicine, as well as by the drug manufacturers who have already taken a prominent part in the movement of opposition.

As a quick remedy for some of the sociological diseases of the past, a more or less communistic structure of society is bound to appeal to the reformers of India and China, and in some degree to those of Mexico. The conditions which exist in those retarded countries do not prevail here in any great degree. Yet we must not blind ourselves to the fact that even in the United States the provision of medical care is not uniformly all that could be desired. The coöperation of the profession in the organization of various systems of group medical practice is at least a partial admission that improvement is possible.

The abolition of private practice in the United States is altogether unlikely. The greater the general prosperity in any country, the greater the tendency for at least a large part of the community to demand private medical care. But is it altogether reasonable to suppose that such further extension of state medicine as proves inevitable will be entirely bad, or necessarily more corrupt and inefficient than much that now occurs in private work among corresponding strata of the general population?

We are told that in Mexico something very like a missionary spirit of enthusiastic service has been shown by the young physicians who have been trained for work in the backward communities. Concerning Russia, similar statements are too frequent and too explicit to be altogether incredible. Thus, for example, Lipetz (Postgraduate Medical Journal, 1942, January) praises the teamwork between different specialists, and the friendly discussions between doctor and patient, in a polyclinic near Moscow. We are reminded that "the doctor's working day is spent in seeing patients and not in rushing about from nursing homes to hospitals or covering a large mileage through the busy streets of towns . . . In the Soviet Union each is a full-time worker in his institution." As to qualification, Lipetz found it high, judged by British standards of general practice, although judged by British hospital standards it was often less than would be expected from a hospital consultant in England.

Lipetz quotes an English informant as attributing such virtues as are possessed by the Russian medical system, especially in relation to scientific development, to "the fact that the supreme body in Soviet medicine, the Commissariat of

Health," is "largely composed of eminent practical clinicians and scientists." If, in spite of the organized opposition, a plan for state medical care is adopted by the national government of the United States, it should be administered by "eminent practical clinicians and scientists" and not by a group of lay bureaucrats whose pet theories may encourage the worst rather than the best possibilities of the relation between physician and patient.

W. H. Crisp.

BOOK NOTICES

TRANSACTIONS, SECTION ON OPHTHALMOLOGY, AMERICAN MEDICAL ASSOCIATION, 1942. Clothbound, 372 pages, illustrated. Printed by the American Medical Association, Chicago, Ill.

This volume presents the 15 papers which were read at the meetings of the Section on Ophthalmology at the 93d annual session of the American Medical Association, held at Atlantic City, on June 8th to 12th. The chairman's address by Dr. Lawrence T. Post, "Lifelong care of the eyes," sketched briefly the highlights of preventive ophthalmology—prenatal, childhood, and adult. Of interest is the discussion of degenerative (senile) ocular diseases, in which a summation is made of possible dynamic approaches to this problem.

Dr. Lowell S. Selling reported on "The ophthalmologist's place in the prevention of traffic accidents," stressing the fact that visual acuity alone is not even a fairly accurate index of a person's ability to drive an automobile, and that color vision does not seem to be of prme importance in the matter of safe driving. "The removal of metallic foreign bodies from the eyeball and from the orbit" was considered by Dr. Edmund B. Spaeth, with particular regard to procedures and instruments which are of considerable aid, and which are too little used in this type of surgery. Dr. Spaeth presented the various methods of using roentgenography to assist in localization and removal of foreign bodies, and this discussion was amplified by photographs and case histories. Included is a description of the use of air injection into Tenon's capsule, as an aid in localization, and of the proper use of the endoscope of Thorpe.

Drs. C. S. O'Brien and J. H. Allen, in "Ocular changes in young diabetic patients" presented an interesting, pithy summary of their study of 555 young diabetics, revealing the interesting fact that 4 percent of them showed diabetic retinopathy; and that 13.8 percent of 260 patients showed diabetic lens changes. Of great importance in this paper, as is brought out in the comment, is the fact that it seems to go a long way toward settling the question of whether or not there is such a pathologic entity as diabetic retinitis, since in most of these patients no other disease was found. The paper of Dr. James W. Smith, entitled "Ochronosis of the sclera and cornea complicating alkaptonuria," is an excellent elucidation of a metabolic disease little known to ophthalmologists. The thoroughness and clarity of this study of the literature, of the theories advanced to explain this metabolic disorder, and of the presentation of cases make interesting reading. The article is well illustrated and contains colored plates of the gross and slitlamp ocular findings. Drs. Joseph Tiffin and Hedwig S. Kuhn reported on "Color discrimination in industry," based on a survey of 7,000 industrial employees. The authors do not describe the color test used in their study.

Dr. Walter B. Lancaster made an interesting addition to the literature on aniseikonia with a paper entitled the "Na-

ture, scope, and significance of aniseikonia." The classification of types of aniseikonia, particularly the description of various normal forms, should aid many ophthalmologists in their understanding of this condition. Dr. Lancaster discussed the mechanisms by which abnormal aniseikonia is dealt with by the organism; he posed the very interesting question of how aniseikonia causes the symptoms of eyestrain. Dr. F. H. Verhoeff presented a "Simple quantitative test for acuity and reliability of binocular stereopsis." Directions for the construction of this device are included, and a system presented for the grading of acuity of stereopsis, based on the Snellen notation for visual acuity. The test is compared to the Howard-Dolman test for stereopsis. The abstract of the discussion of this paper presents several interesting views on the determination of binocular stereopsis.

Of the four papers that comprised the symposium on "Geriatrics," three are reproduced in this volume. They are: "Medical geriatrics" by Dr. George M. Piersol, "Neuropsychiatric geriatrics" by Dr. Henry W. Woltman, and "Aging process in eye and adnexa" by Dr. Conrad Berens. This last paper is a detailed consideration of senile changes—"normal"—of each of the ocular and orbital tissues, as well as pathologic senile changes in the retina, lens, and optic nerve. Glaucoma, malignancies, and cataract are discussed.

Dr. T. L. Terry presented "Fibroblastic overgrowth of persistent tunica vasculosa lentis in premature infants. IV. Etiologic factors." Here Dr. Terry speculates on the possible causes of this uncommon condition and suggests a theory based on the precocious increase in blood pressure before disappearance of the hyaloid artery. This would stimulate a fibroblastic overgrowth to support the hypertrophied hyaloid system. Dr. J. Goldsmith contributed a detailed, carefully worked-out study of the "Dynamics of intracapsular cataract extraction." Using freshly enucleated cadaver eyes, a series of experiments was performed under slitlamp observation leading to the conclusions that Hanover's canal is an anatomic, closed space; that the hyaloid membrane has no zonular fibers in relation to it; that, in intracapsular extraction, tumbling coupled with external pressure over the scleral surface produced the most efficient and least traumatizing rupture of the zonule. This article is accompanied by numerous photographs.

Dr. Moacyr E. Alvaro, guest of the Section on Ophthalmology, presented "Effects other than anti-infectious of sulfonamide compounds on the eye." This paper summarizes the ocular complications of sulfonamide therapy reported in the literature, with special emphasis on transient myopia, the most commonly reported complication. Dr. Alvaro points out that there is some relation indicated between the amount of sulfonamide administered, the duration of the therapy, and the degree of myopia. The exact mechanism of the phenomenon is not yet known. Dr. Edward Steiren presented to the meeting a "Metal safety and glare goggle."

The numerous excellent papers included in this volume are in keeping with the high standards of the Section on Ophthalmology with regard to research and observation.

Benjamin Milder.

KAISER WAKES THE DOCTORS. By Paul de Kruif. Clothbound, 158 pages. New York, Harcourt, Brace and Company, 1943. Price, $3.00.

This book is written in the usual dramatic style that the author has assumed in

order to catch the attention of the public. Such a method does not lend itself to a scientific portrayal of a subject, but the latter would not be read by the general public. De Kruif states that he has always been an enthusiastic admirer of physicians, but that after a careful study of the economics of prepaid medical care as illustrated in the hospitals established by Henry J. Kaiser in connection with his shipbuilding plants and earlier Grand Coulee Dam project, he has become convinced that this, contrary to the opinion of organized doctors, is a most desirable method of handling the problem of supplying adequate medical treatment to the middle-income patients, who cannot afford the best that medicine has to offer unless they are willing to accept charity.

In this book he describes in great detail the experience of Dr. Sidney Garfield with prepaid care, first among the men engaged in construction on the Arizona desert and later in the Kaiser projects. According to the author, this experiment was astonishingly successful not only in the care of the patients but also financially. Modern hospitals were built at great expense but were rendered free from debt in a miraculously short period of time, due only to the payment of from 5 to 7 cents per patient per day, which covered 60 percent of the expense, the money paid by interested insurance companies accounting for the remaining 40 percent. Not only were beautiful hospitals built but they were equipped in the most approved modern manner, even including air conditioning, and a very complete staff of young physicians was employed at excellent salaries.

According to the author, stout objection to these projects was registered by organized medicine and by many of the local physicians, but the essential value of the projects and the efficiency of their management were such as to overcome all objections.

The author admits that this ideal handling of medical needs cannot be accomplished everywhere in the United States without modification for the local conditions. He urges that it be directed by physicians themselves and not by the central government. He is convinced that it should be and will be the best method of administering medical care in the future for those who cannot provide for the great expense of physicians employed privately and who are not in the indigent class.

Lawrence T. Post.

OBITUARY

CLIFFORD BLACK WALKER, M.D.
1884-1943

Clifford Black Walker died on July 3, 1943, at the age of 58 years. He died during an acute exacerbation of a prolonged illness. This illness had interrupted his research of incalculable importance on separated retina.

Dr. Walker was born in Cambridge, Vermont, on August 9, 1884. When he was three years of age his family moved to South Pasadena, California, where he received his preliminary education. He was graduated from the University of California in 1906 with the degree of Bachelor of Science and entered the School of Engineering, receiving his degree. In 1911 he received the degree of Doctor of Medicine with honors from Johns Hopkins Medical School.

It was at Johns Hopkins that Dr. Walker's genius was first recognized. Dr. Harvey Cushing referred to him as "the modern Helmholtz." Dr. Cushing influenced Dr. Walker to come to Boston and in association with Cushing he did his

notable work on visual-field studies in relation to neurologic conditions.

Dr. Walker entered the Massachusetts Eye and Ear Infirmary, taking both Eye and Ear, Nose, and Throat residencies. During his years there and thereafter his inventive and mechanical ability led to his designing numerous ophthalmic instruments.

Dr. Walker finally became interested in the problem of separated retina, work for which he seemed predestined because of his natural mechanical ability, his mathematical mind, his interest in electrical engineering, and his inexhaustible imagination. He undertook the problem with a zeal and thoroughness that seemed fanatical to anyone not a perfectionist. One incident may illustrate this. A farewell party was being given for Colonel and Mrs. Robert E. Wright by the Los Angeles Research Study Club. Throughout dinner and the entertainment that followed, Dr. Walker sat at a table in an obscure corner working on some electrodes for treating macular holes. Several people remarked to Colonel Wright about his eccentricity. No one knew that Dr. Walker was getting instruments ready for Colonel Wright to take back to India and there were but a few hours before he would be leaving. Some months later I heard Colonel Wright remark that whatever Dr. Walker's eccentricities might be, his instruments were the most perfect he had ever used.

Dr. Walker's efforts on detached retina soon bore fruit. His local colleagues, expressing deep respect for him and trust in his work, openly agreed to refer all detachment cases to him. This meant he observed and treated an exceptionally large number of cases. The results of his concentrated effort were manifested in an increase in cases cured from approximately 25 to 80 or 90 percent. Over a period of about 15 years his technique became more and more perfect, and results more and more consistently satisfactory. Even today few ophthalmologists anywhere realize the possibility of so high a percentage of cures. They will achieve them only when Dr. Walker's ideas and methods are better understood. He knew the literature on the subject completely, and his technique incorporated the best ideas with his own.

Dr. Walker was present at all local or national meetings where any phase of detachment of the retina was presented. Like most truly research-minded men, he was not interested in achieving fame through priority in publication or in economic reward, but was content to solve problems in his own mind. For this reason much of his work may be lost unless one ferrets it out of the proceedings of local eye meetings. He realized that time was short for what he wanted to accomplish and worked to an extreme that hastened his collapse. When younger associates warned him that he might defeat his own purpose, he would remark that, after all, Newton wasn't producing after he was 35 years old, and he had to work before his brain was too old to have ideas. He always felt there "wasn't enough time." He begrudged the hours he spent sleeping.

Dr. Walker was clinical professor of surgery (ophthalmology) at the University of Southern California School of Medicine; formerly professor of clinical ophthalmology at the College of Medical Evangelists; at one time assistant in ophthalmology at the Harvard Medical School, Boston; served as a member of the American Board of Ophthalmology.

He was a member of the American Academy of Ophthalmology and Otolaryngology, American Ophthalmological Society, Association for Research in

Ophthalmology, Western Ophthalmological Society, and the Pacific Coast Oto-Ophthalmological Society.

He was past president of the Los Angeles Society of Ophthalmology and Otolaryngology; served on the staff of the California Hospital, Eye and Ear Hospital, Good Hope Clinic, Los Angeles County Hospital, and Hospital of Good Samaritan; formerly on the staff of the Peter Bent Brigham Hospital, Boston.

In 1914, Dr. Walker received the first Knapp Medal from the Section on Ophthalmology of the American Medical Association for his paper on "Topical diagnosis of the hemiopic pupillary reaction and the Willbrand hemianopic prism phenomenon, with a new method of performing the latter."

Dr. Walker had a loving and appealing personality, born of true sympathy and consideration for his fellow men. He was a gracious host, an ideal companion for a medical meeting, and in any gathering could entertain with lively and witty discussion and repartee on any subject. His fund of knowledge related to economics, politics, music, or the arts, including culinary, was most amazing. He was very modern in his interest and his way of life. He was the first in town to have an automatic gear-shift, a Novachord, or any other modern invention that was worthwhile.

Dr. Walker is survived by his wife, Mary McAvoy Walker, who has been patient and understanding throughout their 20 years of married life, appreciative of his efforts in the pursuit of scientific truth. To her and to his friends and associates, Dr. Walker's death means a great and irrevocable loss.

S. Rodman Irvine.

NOTICE TO SUBSCRIBERS

This is to remind you that if you have interesting refraction cases, the proposed Refraction Department of the Journal would like to consider them for publication. Send your histories to the editor.

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy, embryology, and comparative ophthalmology

3

PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Yasuna, Elton. **Homatropine-paredrine emulsion as a cycloplegic.** Arch. of Ophth., 1943, v. 30, July, pp. 87-92.

There has been considerable literature in the last few years upon the cycloplegic action of a mixture of homatropine and paredrine. The author reports further work on the problem, his study differing in three respects from that of any previous report. Firstly, instead of an aqueous solution, an emulsion was used consisting of paredrine, homatropine, acacia, liquid petrolatum, glycerine, merthiolate, and water. Secondly, refraction was performed on each subject with the cycloplegic alone, either atropine sulphate or homatropine hydrobromide, and then with the homatropine-paredrine emulsion. The third difference was that the study was limited to hyperopic children from five to 16 years of age.

Forty-six percent of the subjects studied with atropine sulphate accepted more plus sphere with this cycloplegic than with paredrine-homatropine emulsion; 19 percent accepted less plus sphere, and in 35 percent of the cases the results were identical. One drop of an emulsion of paredrine hydrobromide plus homatropine hydrobromide is a better cycloplegic than one drop of an aqueous solution of homatropine hydrobromide instilled every ten minutes for one hour.

At the time of the refraction under the emulsion each patient was given a questionnaire. The reports indicated that the average child was able to read in about 16 hours, and that the average time for complete wearing off of the effect was 24 hours. Most patients preferred this method of cycloplegia. (References.) Ralph W. Danielson.

4

OCULAR MOVEMENTS

Gill, E. G., and Gressette, J. M. **Management of crossed eyes based upon observation of 46 cases.** Virginia Med. Monthly, 1942, v. 69, Aug., pp. 420-422.

Each strabismus case presents variations which make diagnosis and treat-

ment difficult problems. The questions will arise whether a case is medical or surgical and what type of treatment is indicated, whether we can strive for only cosmetic or for cosmetic and physiologic results, or whether orthoptic training is of any avail. In order to arrive at a proper diagnosis, a definite routine examination is of importance. The visual power, the fusion faculty, and diplopia reactions are to be determined as well as the behavior of the eye movements under concomitant tests and the amount of deviation with and wthout glasses for far and near, and with and without cycloplegia. The writers classify strabismus as follows: pseudoparalytic, accommodative, due to or associated with fusion defects, due to or associated with amblyopia, due to or associated with neuromuscular defects, due to or associated with anisometropia, and due to or associated with multiple defects or hereditary tendency. The treatment should begin as soon as the squint becomes manifest, regardless of age. For orthoptic training the age of the patient should be not less than four years, the vision in the poorer eye should be at least 20/40, and retinal correspondence must be normal. As to surgery the authors use the Lancaster resection or a recession method for lateral strabismus. Surgical treatment is resorted to if the medical treatment is not successful in 6 to 12 months. (Bibliography, 7 figures.)

Melchiore Lombardo.

Guibor, G. P. **Ophthalmic prisms, some uses in ophthalmology.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 833-845. (One chart, 6 diagrams, references.)

Hicks, A. M. **Congenital paralysis of lateral rotators of eyes with paralysis of muscles of face.** Arch. of Ophth., 1943, v. 30, July, pp. 38-42.

Congenital bilateral paralysis of the muscles which move the eyes in the horizontal plane and congenital bilateral paralysis of the muscles of the face occasionally occur together. The author reviews the literature and gives reports of four cases. (References.)

Ralph W. Danielson.

Leopoldsberger, W. **Influence of external factors upon the fusion faculty.** Wiener klin. Woch., 1942, Sept. 4, pp. 705-711. (See Section 3, Physiologic optics, refraction, and color vision.)

Luckiesh, M., and Moss, F. K. **Initial and residual effects of ophthalmic prisms on visibility and accommodation.** Arch. of Ophth., 1943, v. 29, June, pp. 968-974. (See Section 3, Physiologic optics, refraction, and color vision.)

5

CONJUNCTIVA

Feldman, L. A., and Sherman, H. **Hypersensitiveness of the mucous membranes. 3. Slitlamp studies of the conjunctival reactions induced in normal and in atopic persons with histamine, ethylmorphine, and atopens.** Arch. of Ophth., 1943, v. 29, June, pp. 989-995.

The bulbar conjunctiva provides an ideal site for slitlamp study of reactions produced by application of various substances to the conjunctiva. A number of eyes were studied in this manner and the resulting reactions recorded. When histamine or an allergin was instilled, the blood vessels dilated in the following sequence: deep large vessels, superficial fine vessels, superficial large vessels, and finally the deep

fine vessels. The histamine and allergin reactions could not be differentiated. Ethylmorphine hydrochloride produced dilatation mainly of the deep network and then slightly of the superficial vessels. Epinephrine hydrochloride produced contraction of the vessels equally after all types of reaction. No essential difference was found between the specific reactions to antigens induced in the naturally sensitive conjunctiva and that produced in the passively sensitized conjunctiva. Itching was characteristic of the reaction to pollen. With histamine and ethylmorphine itching was usually absent but some of the subjects complained of a burning sensation. (4 tables.)

John C. Long.

McCulloch, J. C. **Origin and pathogenicity of Pseudomonas pyocyanea in conjunctival sac.** Arch. of Ophth., 1943, v. 29, June, pp. 924-935.

Pseudomonas pyocyanea has long been known to produce a serious infection of the eye, often with the formation of corneal ulcer. The organism may be present in the normal flora of the eye, may be introduced by the use of contaminated eye drops, or may get into the eye from infection elsewhere in the body.

A search of the bacteriologic data in about 5,000 case records of eye diseases observed at the Institute of Ophthalmology and Vanderbilt Clinic yielded 18 cases in which Ps. pyocyanea had been demonstrated. In 28 percent of these cases it was found that the infection had been introduced through the use of contaminated eye drops. The organism produced corneal ulcer, endophthalmitis following iridectomy, meibomitis, and infection after trephining. Cultures were made of samples from all bottles of ophthalmic solutions used in the hospital and in some private offices. The Ps. pyocyanea was found in an occasional bottle of pontocaine hydrochloride, pilocarpine hydrochloride, ethylmorphine hydrochloride, scopolamine hydrobromide, and atropine sulphate solution. Contamination of physostigmine salicylate and fluorescein was very frequent, especially the former. It was noted that if the solutions contained the organism, it was nearly always in pure culture, as the germ produces antibacterial agents.

Various antiseptic agents were added to eye solutions containing Ps. pyocyanea. It was found that considerably higher concentrations were needed to sterilize physostigmine salicylate than to sterilize fluorescein. Boiling the solutions, and changing them frequently, seems to be the best way to assure sterility. A small amount of sodium sulphite will prevent the physostigmine solution from turning red.

A culture of Ps. pyocyanea was instilled into rabbit eyes. It was found that conjunctivitis did not develop unless the eye was occluded. The latter also increased the incidence and severity of corneal invasion in experimentally infected ulcers. A filtrate of Ps. pyocyanea culture produced a severe conjunctivitis when instilled into rabbit eyes, suggesting that toxic material released by the bacilli is probably responsible for Ps.-pyocyanea conjunctivitis.

A number of sulfonamide compounds were tested in vitro against the organism. Of those tested, it was found that sulfathiazole and sulfadiazine were the most effective. (2 tables, references.)

John C. Long.

6

CORNEA AND SCLERA

Conners, C. A., Eckardt, R. E., and Johnson, L. V. **Riboflavin for rosacea keratitis, marginal corneal ulcers and catarrhal corneal infiltrates.** Arch. of Ophth., 1943, v. 29, June, pp. 956-967.

Rosacea keratitis, marginal corneal ulcers, and catarrhal corneal infiltrates all respond promptly to parenteral injection of riboflavin. These conditions are thought to result from actual or relative insufficiency of the flavoprotein enzymes. Riboflavin is a component of at least nine enzymes that play an important role in cellular respiration. It is probable that the effect of Warburg's yellow enzyme is insignificant.

The average riboflavin excretion and, hence, the intake of a series of patients with rosacea keratitis, was found to be considerably less than in a control group. Retention tests after intramuscular injection of riboflavin indicated that patients with rosacea were deficient in this substance.

In the series studied, only one patient with typical superficial marginal infiltrates failed to respond to intravenous use of riboflavin and oral administration of vitamin-B complex. This patient promptly recovered when riboflavin mixed wth whole blood was injected. It is thought that the whole blood supplied some factor or initiated some process necessary for the metabolism of riboflavin. Corneal disease may result either from a diet deficient in riboflavin or from some disorder in the metabolism of riboflavin enzymes. (4 tables, references.)

John C. Long.

Farber, J. E., and Margulis, A. E. **Blue scleras, brittle bones, and deafness.** Arch. Internal Med., 1943, v. 71, May, pp. 658-665.

The authors report a previously unrecorded family of 57 members, 12 of whom have been affected with the blue-scleras syndrome. Seven of the 12 members have both blue scleras and brittle bones. Four have these defects with deafness, and one has only the blue scleras. Eight of the affected members are males; four, females. The condition is transmitted from generation to generation, affecting four generations in the detailed genealogic family tree presented. Three members of the group have been studied in detail.

T. E. Sanders.

Folk, M. R. **Marginal degeneration of cornea.** Arch. of Ophth., 1943, v. 29, June, pp. 975-980.

Marginal degeneration of the cornea is a disease of unknown causation, is usually bilateral, and affects males in about 75 percent of the cases. Approximately 559 cases have been described in some detail in the literature. The disease is probably not rare, but many cases escape detection because of its mildness. Typically the disease starts with a peripheral opacity closely resembling and usually superimposed on an arcus senilis. Gradually a gutter-like furrow appears, usually between the arcus and the limbus, but occasionally central to it. The epithelium is not destroyed but the gutter deepens with a shelving peripheral and steep central margin. The furrow becomes vascularized. As the gutter gets deeper an ectasia results from intraocular pressure. Finally there may be perforation of the furrow with prolapse of the iris. The process is extremely slow, and the development of ectasia may require ten to twenty years. The chief symptom is visual failure due to the development

of gross astigmatism although at times there are irritative symptoms similar to those of a mild conjunctivitis.

The author reports a case of this condition in a man of 21 years. The patient complained of recurring attacks of irritation and slight photophobia. The eyes showed slight pericorneal injection and a corneal opacity. This opacity was circular and near the limbus, varying in width from 3 mm. vertically to 1.5 mm. horizontally. A pannus covered the entire opacity and within the opacity there were many chalky, punctate opacities. The slit-lamp showed some areas of beginning ectasia. The corrected vision of each eye was 0.8. Treatment consisted of sulfanilamide orally and sulfathiazole ointment locally. In addition, large doses of vitamins A, B, and D were given and tinted lenses prescribed. The patient showed improvement and the photophobia disappeared. The author states that it is too soon to predict the results and to claim that this is the proper method of treatment. (2 illustrations, references.) John C. Long.

Pullinger, B. D. **A technique for the microscopic examination of the cornea.** Jour. Path. and Bact., 1943, v. 60, Jan., pp. 97-99.

The author describes a new technique for silver staining of the cornea, especially useful for demonstrating the corneal corpuscles. It is also of particular use in experimental work not adaptable to routine histologic examination. T. E. Sanders.

Perritt, R. A. **Corneal transplantation.** Arch. of Ophth., 1943, v. 30, July, pp. 14-24.

The author presents the evolutionary stages through which his work on corneal transplantation has passed. He discusses sources of transplants, preservation of the eyes, examination of the recipient eye, indications and contraindications for surgery, histologic prerequisites of the leukoma, and microscopic studies of the transplant.

Cases have been classified into three groups: favorable, unfavorable, and for cosmetic effect alone. Cases are favorable only if (1) intraocular tension is normal, (2) the diseased ocular tissue is limited to the cornea, (3) the corneal leukoma is not very dense although sufficiently so to cause considerable impairment of vision, and (4) clear areas surround the leukoma. The prognosis is favorable in quiet interstitial keratitis, keratoconus, blood staining of the cornea, and central circumscribed corneal leukoma.

The outlook is unfavorable when (1) a dense leukoma extends over almost the entire cornea, (2) there is aphakia, (3) the intraocular tension is increased, or (4) there is corneal cloudiness with densely vascularized pannus. In this group of cases preliminary operations must be performed before corneal transplantation in order to prepare a more favorable soil for final keratoplasty. (11 case reports, 11 figures, references).

Ralph W. Danielson.

7

UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Ellis, O. H. **Free-floating cyst of the anterior chamber.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 859-860. (References.)

Meesmann, A. **Practical importance of pupillary disturbances.** Med. Klinik, 1942, v. 38, Oct. 9, pp. 971-973.

The author discusses briefly amau-

rotic, reflex, and absolute pupillary paralysis, and the tonic pupil. Kehrer and Adie have described 12 different types of the latter, the classification depending mainly on its association with other reflex anomalies. Absence of the patellar reflex is found in about 60 percent, and exaggeration of this reflex in about 20 percent. Vasomotor disturbances, migraine, and pituitary symptoms are often found simultaneously. A hereditary disposition seems to play a role in development of pupillary disturbances after infectious diseases, alcoholism, and other factors.

Bertha A. Klien.

Rooks, J. T. **Adie's syndrome.** Arch. of Ophth., 1943, v. 29, June, pp. 936-941.

Adie's syndrome consists of a unilateral myotonic pupil associated with the loss of one or more of the deep tendon reflexes. The myotonic pupil is usually present in one eye only, is sometimes oval or irregular in shape, is nearly always larger than its fellow, and is occasionally widely dilated. It may be partially or wholly inactive to light and incompletely or entirely inactive to accommodative effort. Adie's syndrome is of unknown etiology and does not affect the general health or life expectancy.

The author reports two cases of this condition. The first is of a 44-year-old man. The left pupil was dilated and failed to respond either to light or to accommodation. The knee, ankle, and cremasteric reflexes on the right side were absent. The second patient was a 55-year-old man. His right pupil was irregular and dilated. It did not respond to light and accommodation in the usual way. The ankle reflexes were absent and the patellar reflex was elicited on the right side only after reenforcement. Neither patient gave any evidence of syphilis. (References.)

John C. Long.

Scheie, H. G., Moore, E., and Adler, F. H. **Physiology of aqueous in completely iridectomized eyes.** Arch. of Ophth., 1943, v. 30, July, pp. 70-74; also Trans. Amer. Ophth. Soc., 1942, v. 40, p. 245.

It has been established that the aqueous humor contains less urea than the circulating blood. Urea should be present in equal amounts in aqueous and blood if the aqueous is formed by dialysis alone. The low urea content of aqueous has been attributed to lack of permeability of the blood-aqueous barrier to urea. The aqueous urea equals the blood urea only under one condition, and that is after the anterior chamber has been opened, the aqueous evacuated, and the secondary or plasmoid aqueous allowed to form.

In an attempt to throw light on these problems the authors iridectomized a large number of cat eyes and made various determinations. The fluid which reforms in the iridectomized eye has a higher protein content than the original aqueous, but never approaches that in an eye with an attached iris. The volume of the anterior chamber was considerably reduced, being approximately 40 percent less than normal. The tension was reduced 60 percent below normal. The high protein content of the secondary aqueous in normal eyes probably comes from the iris. The iris may also be concerned with the formation of normal aqueous.

A number of practical points are suggested by these results. When there has been a hemorrhage into the anterior chamber as a result of trauma, it is probably better not to dilate the pupil, since absorption of blood seems

to depend on the presence of the iris stroma. A basal iridectomy for glaucoma not only should be basal but should be broad. Part of the effect may be elimination of a portion of the filtering surface as well as freeing of the chamber angle. (4 tables, references.) Ralph W. Danielson.

Schlaegel, T. F., Jr., and Davis, J. B. **The reaction of the rabbit eye to normal horse serum.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 785-798. (2 tables, 9 photomicrographs, references.)

8

GLAUCOMA AND OCULAR TENSION

Posner, Adolph. **Standardization and checking of Schiötz tonometers.** Arch. of Ophth., 1943, v. 30, July, pp. 1-13.

Every ophthalmologist has at one time or another doubted the reliability of his tonometer, and unfortunately has not had an adequate method or place for having his tonometer checked. In Europe checking stations were established about 1925, but the author organized the only one in the United States and it operated only from 1935 to 1939.

The Committee on Glaucoma of the National Society for the Prevention of Blindness is now establishing a checking station for Schiötz tonometers at 1790 Broadway, New York.

This article discusses the specifications for a tonometer, the equipment of a checking station, and the procedure of checking tonometers. (References, 7 figures.)

Ralph W. Danielson.

9

CRYSTALLINE LENS

McKee, T. L. **Restoration of binocular vision after unilateral cataract extraction.** Arch. of Ophth., 1943, v. 29, June, pp. 996-999. (See Section 3, Physiologic optics, refraction, and color vision.)

10

RETINA AND VITREOUS

Bock, R. H. **Diabetic retinosis in the Chinese.** Arch. of Ophth., 1943, v. 29, June, pp. 919-923.

Among 183 Chinese patients with diabetes, 49 had diabetic retinosis. The age group with the highest incidence of retinosis was that between 50 and 60 years. The average duration of the diabetes before the onset of the retinal condition was seven years. It was noted that the blood sugar of diabetic patients with retinosis was consistently higher than in patients without it. Thus the average fasting blood sugar of those with retinosis was 209 mg. per hundred c.c., while those without retinal damage had an average of only 174 mg.

Renal function tests showed no greater incidence of impaired function in patients with retinosis than in those without. Also there was found to be no difference in the incidence of hypertension, arteriosclerosis, acetone bodies and cholesterol. The lesions of diabetic retinosis are most likely of capillary origin. It may be assumed from these statistical data that an increased blood-sugar content persisting over a long period damages the capillaries and thus indirectly is the cause of the fundus change. (References.)

John C. Long.

Bower, L. E., Ditkowsky, S. P., Klien, B. A., and Bronstein, I. P. **Arteriovenous angioma of mandible and retina with pronounced hematemesis and epistaxis.** Amer. Jour. Dis. Children, 1942, v. 64, Dec., p. 1023.

A nine-year-old boy was admitted to the hospital for frequent epistaxis and hematemesis. At the admission an almost imperceptible bluish discoloration was found over the lower part of the left cheek. A thrill and a bruit synchronous with the entire cardiac cycle were elicited over this area. Roentgen examination revealed large cystic spaces in the left mandible. The lower incisors and the first molar were loose and movement of the teeth caused bleeding. After removal of the molar an infection set in and after healing the roentgenogram failed to show the cystic spaces previously noted. The X ray further revealed that the left optic foramen was enlarged. The left pupil did not react to light. Fundus examination disclosed that from the optic disc a large number of tremendously dilated and dark-colored, tortuous vessels emerged, among which the arteries and veins were barely distinguishable and some branches near the disc were three to four times their normal size. The vessels formed preretinal and prepapillary loops, but toward the periphery they again took on a normal appearance. There were no retinal nodes or tumors. The conglomeration of dilated, tortuous, and dark-colored vessels pointed to the existence of an arteriovenous communication.

R. Grunfeld.

11

OPTIC NERVE AND TOXIC AMBLYOPIAS

Argüello, D. M., Lambre, P., and Tosi, B. **Concerning a case of Crouzon disease.** Arch. de Oft. de Buenos Aires, 1941, v. 16, Dec., p. 665.

The authors report a case of craniofacial dysostosis or Crouzon disease, in an 11-year-old girl. Hereditary antecedents were entirely negative. The vision was considerably reduced by the presence of optic atrophy, but X-ray examination of the skull showed the optic foramina to be essentially normal. The patient was of average intelligence. (Photographs, X-rays, bibliography.)

Plinio Montalván.

Faber, H. K., and Towne, E. B. **Early operation in premature cranial synostosis, for the prevention of blindness and other sequelae.** Jour. of Pediatrics, 1943, v. 22, March, p. 286.

As soon as premature synostosis of the cranial sutures has been diagnosed, the authors advocate excision of strips of bone parallel to the closed suture or sutures. The operation has to be performed early in infancy, preferably before the age of six months. By early operation, loss of vision, exophthalmos, cranial deformity, convulsions, and other serious sequelae can be prevented.

Five case histories are given. All five patients were operated on early, and the operative results are highly satisfactory. The three older patients, 17, 13, and five years after the operation, now have normal vision, normal appearance, normal cranial circumference, and intelligence of superior grade.

R. Grunfeld.

Fink, W. H. **The ocular pathology of methyl-alcohol poisoning.** Amer. Jour. Ophth., 1943, v. 26, July, pp. 694-709, and Aug., pp. 802-815. (References.)

Hansraj, J. **Kroenlein's operation for a case of cyst of the optic nerve.** Indian Jour. Ophth., 1943, v. 4, Jan., pp. 6-8.

Proptosis in a 32-year-old woman had developed slowly for about three years. The vision was failing rapidly and was reduced to counting fingers at five feet when the patient was first

seen by the writer. There were pain and restricted motion of the globe but temperature and blood-count were normal. Diagnostic puncture behind the globe drew out a few drops of serous fluid. Kroenlein's operation was done in preparation for removal of a possible tumor, but revealed a cyst of the optic nerve. The cyst wall was firmly adherent to Tenon's capsule and only parts of it could be removed. The cyst refilled twice within a few days after the operation, and was emptied by repeated punctures. After a month there was no reappearance of the proptosis and vision had returned to normal.

Jerome B. Thomas.

Kravitz, D. **Pigmentation of the optic disc.** Arch. of Ophth., 1943, v. 29, May, pp. 826-830.

Kravitz reviews the literature and then reports three cases, very probably congenital, in young people. These cases were found by fundus examinations incidental to refraction and, as one would expect, produced no symptoms. The appearance of the pigmented spots gave the impression that they were congenital pigmented nevi similar to those found on the skin. Interesting was the presence of a cilioretinal vessel in every case. The author agrees with the explanation given by Duke-Elder and Mann, that the pigment arises from primitive cells of the optic stalk which have regressed and developed characteristics of pigment-forming cells in a place where they should have developed other functions. Probably the anatomy of the optic disc, with the sparseness of fibers and vessels on the temporal side, makes this the usual site of predilection. (References, 2 drawings.) Ralph W. Danielson.

Loewenstein, A. **Marginal hemorrhage on the disc. Partial cross tearing of the optic nerve. Clinical and histological findings.** Brit. Jour. Ophth., 1943, v. 27, May, pp. 208-215.

An ophthalmoscopic picture not hitherto mentioned in the literature is described. The patient had a perforating wound in the sclera, caused by the dropping of a nail from a considerable height into his right eye. Examination revealed a clear cornea with deep anterior chamber, 2 mm. of hyphema, and a small pupil with clear lens and a dull fundus reflex. No fundus details were visible and there was severe hypotonia. The vision was fingers at 0.5 m.

Fourteen days later, in spite of diffuse vitreous opacities, a clear red arcuate band was visible at the temporal margin of the disc. The breadth was that of the central vein, and a pigment ring outlined the temporal margin of the red band. The marginal hemorrhage remained unchanged in appearance during two months of observation. Three fine radial striate hemorrhages around the disc vanished during this period of observation.

From analyses of histologic findings in other cases, the marginal arcuate hemorrhage is explained as due to a cross tear of peripheral nerve fibers at the insertion of Bruch's membrane. (6 illustrations, references.)

Edna M. Reynolds.

Ryan, E. **Optochiasmic arachnoiditis.** Arch. of Ophth., 1943, v. 29, May, pp. 818-830.

The author says there are still too few ophthalmologists who recognize the importance of this disease, its dire consequences to vision if not early diagnosed or suspected, and the excellent results that may be obtained by surgical intervention. The symptomatology is varied, but visual loss and headache are in the great majority of

cases the only symptoms complained of. The fundi may be completely normal, or examination may disclose a choked disc or an optic-nerve atrophy of either the primary or the secondary type. Any type of field defect may be encountered.

Ryan refers to the paper by Hausman in which attention was called to the important role played by syphilis in arachnoiditis, and in which the syphilitic forms were classified in three distinct groups (Arch. of Ophth., 1940, v. 23, p. 1107). Heretofore when specific fundus disease and field defects were encountered in syphilis, they were almost universally considered to be due to parenchymatous disease of the nerve, regardless of evidence of tabes. The possibility that adhesions about the nerves and chiasm may cause the pathologic change has been insufficiently considered. Patients with this type of arachnoiditis should be treated energetically.

Three cases of optochiasmic arachnoiditis are reported, two in childhood and one in middle age. (Fields, references.) Ralph W. Danielson.

Steinberg, Theodore. **Coloboma of the optic nerve.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 846-849. (One fundus photograph, fields, bibliography.)

12

VISUAL TRACTS AND CENTERS

Bender, M. B., and Savitsky, N. **Micropsia and teleopsia limited to the temporal fields of vision.** Arch. of Ophth., 1943, v. 29, June, pp. 904-908.

Micropsia, teleopsia, and metamorphopsia are usually associated with lesions of the retina, cortex, or occipital lobe. The authors report the case of a 35-year-old man with diabetes insipidus and other general symptoms of a lesion in the region of the chiasm. The patient had multiple small irregular scotomas in the temporal fields, chiefly in the inferior quadrants. Throughout these areas also there were definite micropsia, teleopsia, and a tendency to reverse or turn the image of the object observed. Operation and later autopsy showed an epidermoid tumor in the interpeduncular space, compressing the chiasm and the floor of the third ventricle. There was no brain lesion posterior to this region. This is an example of visual aberrations arising from a peripheral lesion, with no disturbance of the cortex or occipital lobe. (Fields, charts, references.) John C. Long.

Chace, R. R. **Structural changes in external geniculate body of rat following removal of eyes.** Arch. of Ophth., 1943, v. 30, July, pp. 75-86.

For many years research has been carried out on the problem of the cellular response in the developing nervous system to the presence or absence of peripheral stimuli. In a consideration of these responses of the central nervous system to increased or decreased peripheral demands, one finds that the optic pathways lend themselves admirably to such changes. If one destroys an optic nerve or removes an eye, there is a somewhat progressive transformation in the visual pathway. There seems to be no uniformity in the literature as to just how far back from the eye the changes extend.

Experiments were, therefore, done on newborn and adult rats. The conclusions are: (1) Removal of one eye from a newborn rat causes degeneration of the optic nerve and tract corresponding to that eye. (2) The brains of rats born with microphthalmic or

degenerate eyes lack optic nerves, chiasms, and tracts, and the external geniculate bodies exhibit a definite hypoplasia. (3) Removal of one eye in an adult animal is followed by atrophy of the optic nerve. Gross changes have not been noted in the chiasma or optic tract, nor any microscopic alterations in the external geniculate body. (7 illustrations, 1 graph, 3 tables, references.)

Ralph W. Danielson.

Frank, M., and Pijoan, M. **Mumps and associated nephritis complicated by encephalitis and blindness.** Southwestern Med., 1943, v. 27, April, pp. 95-97.

The authors report the case of a fourteen-year-old Indian boy with acute epidemic bilateral parotitis, complicated by nephritis. After about six days headache and drowsiness supervened; three days later the patient complained of absolute blindness. This lasted about three days and the vision then rapidly returned to normal. The ophthalmological and neurological examinations were negative. No explanation is offered for the sudden loss of vision, but the symptoms of headache and drowsiness and the laboratory studies of the spinal fluid lead the authors to conclude that the essential disease complicating the parotitis was an encephalitis. The relation of the nephritis to the parotitis is not clear, but they subsided together. (9 references.) Jerome B. Thomas.

Levin, Max. **Diplopia in narcolepsy.** Arch. of Ophth., 1943, v. 29, June, pp. 942-955.

Narcolepsy is a syndrome characterized by brief attacks of sleep and brief attacks of flaccid paralysis without loss of consciousness. The attacks usually occur in response to some emotion, such as laughter or excitement. The author describes in considerable detail Pavlov's work on internal inhibition and sleep, and states that attacks of narcolepsy occur with significant frequency under conditions duplicating those which in Pavlov's experiments elicited manifestations of cerebral inhibition.

This and other factors suggest that narcolepsy results from a disturbance which renders the cortex unduly exhaustible, the attacks of sleep arising from inhibition of just the motor cortex. Diplopia is frequent during attacks of this disorder and it is suggested that the diplopia arises from transitory inhibition of a cortical mechanism for binocular vision. (References.) John C. Long.

Wagener, H. P., and Love, J. G. **Fields of vision in cases of tumor of Rathke's pouch.** Arch. of Ophth., 1943, v. 29, June, pp. 873-887; also Trans. Amer. Ophth. Soc., 1942, v. 40, p. 305.

This is an analysis of the ocular findings of 29 cases of Rathke-pouch tumors treated at the Mayo clinic. Loss of central vision in one or both eyes was observed in 26 of the 29 cases. Unilateral or bilateral central scotomas and amaurosis of one eye in association with other defects were striking features. Ophthalmoscopically the patients may present normal optic discs, choked discs, simple pallor of the discs, or simple atrophy of the nerve. Roentgenograms of the head were normal in 7 of the 29 cases. Early diagnosis and early surgical removal of the tumors is important. Late postoperative data could be obtained from only 21 of the 29 patients. Four had died. Of the remaining 17, relatively successful results were obtained from operation in 12. (Fields, 6 tables, references.) John C. Long.

13

EYEBALL AND ORBIT

Faber, H. K., and Towne, E. B. **Early operation in premature cranial synostosis, for the prevention of blindness and other sequelae.** Jour. of Pediatrics, 1943, v. 22, March, p. 286. (See Section 11, Optic nerve and toxic amblyopias.)

Lloyd, R. I. **Proptosis as a diagnostic problem.** West Virginia Med. Jour., 1943, v. 39, March, pp. 69-76.

The writer simplifies the problem of diagnosis of proptosis by discussing the various types as they occur in age groups. The new-born infant heads the list with the serious eye injuries incurred in the birth canal, especially in forceps deliveries. Other causes of proptosis evident at birth are nasofrontal meningocele and collections of fluid beneath the periosteum of the orbital roof. Other congenital defects are neurofibromatosis; abnormal position of the eye; and the Hörner syndrome of small optic fissure, retracted eye, and small pupil, due usually to injury of the brachial plexus during birth. During the next age group, which includes children from two years on, chloroma and xanthomatosis may occur. Infections of the orbital cellular tissues are fairly common in young children, originating in the nose and ethmoid cells. To save the eye, early incision of the abscess through the upper lid at the inner corner of the orbit is important, followed by collaboration with the rhinologist to maintain adequate drainage. There is a group of osseous dystrophies, tower skull the most common, in which the eyes are prominent. A mass of hard bone may form in the ethmoidal cells, growing slowly upward into the cranial cavity, finally breaking through into the orbit, and pushing the eye forward. Only in recent years has the attention of the profession been attracted by metastases to the orbit from abdominal malignancies, with resulting proptosis. Basedow's disease is probably the most common cause of proptosis, next to orbital infections from the paranasal sinuses. In conclusion the author emphasizes the following points: (1) Acute proptosis with orbital inflammation and pain is presumably due to an infection which has escaped from the ethmoidal cells and invaded the orbit. (2) An acute proptosis during the nursing period, in an artificially fed infant, should be treated as due to scurvy until proven otherwise. (3) Progressive proptosis coming on soon after birth should suggest hemorrhagic disease of the new-born. (4) In children, a sudden proptosis with enlargement in the temporal fossa appearing soon afterward should suggest chloroma and an examination of the blood. (5) In every case of sudden protrusion of an eye without local inflammation, especially after an accident, the stethoscope should be used to search for a bruit which will clear the diagnosis. (5 plates.) Jerome B. Thomas.

Murphy, E. S. **Improvised exophthalmometer.** Arch. of Ophth., 1943, v. 29, May, p. 844.

On an ordinary pair of compasses, the movable leg has a grooved crosspiece, and to the fixed leg is fastened a spatula which projects 18 mm. beyond the plane of the shorter leg. The groove is placed on the lateral wall of the orbit, the spatula on the center of the cornea. The reading on the protractor scale in degrees is multiplied by three, to give the amount of the proptosis in millimeters. The readings agree

with those of the Hertel exophthalmometer. (2 photographs.)

Ralph W. Danielson.

O'Malley, C. L. C. **Orbital emphysema simulating cellulitis.** Brit. Jour. Ophth., 1943, v. 27, May, pp. 222-226.

Orbital emphysema with protosis was so severe that the eye was subjected to both exposure necrosis and strangulation from the tense eyelids and swollen conjunctiva. A diagnosis of orbital cellulitis was made and the orbit was opened. After the escape of a large amount of gas, the eyeball immediately settled into the orbit, and uneventful recovery followed.

Edna M. Reynolds.

Pendse, G. S. **A rare congenital ocular abnormality.** Indian Jour. Ophth., 1943, v. 4, Jan., p. 1.

The writer reports a case of double anophthalmos accompanied by a small bluish cystoid swelling of the lower lid of one eye. Otherwise the lids and lashes were normal. No other abnormalities, local or general, were found. A reasonable explanation of this anomaly is that no primary optic vesicle has budded out from the anterior primary encephalic vesicle, or that, having budded out, it has failed to form a secondary optic vesicle. The bluish cysts that sometimes are connected with rudimentary eyes are located in the lower part of the orbit or in the lower lid and contain retinal elements. (4 figures.) Jerome B. Thomas.

Smeltzer, G. K. **A study of the retrobulbar tissue in experimental exophthalmos in guinea pigs with reference to primary and secondary modifications.** Amer. Jour. Anatomy, 1943, v. 72, March, pp. 149-165.

In a series of thyroidectomized guinea pigs exophthalmos was produced by injection of anterior-pituitary extract. The exophthalmos is dependent upon and proportional to an increase in the mass of retrobulbar tissue. This consists of edematous infiltration and hypertrophy of the orbital fat, which the author believes are the primary changes and not induced secondarily by the exophthalmos. There is also hypertrophy of the extraocular muscles which may be partly secondary to the exophthalmos.

T. E. Sanders.

14

EYELIDS AND LACRIMAL APPARATUS

Berkley, W. L. **Treatment of cicatricial entropion.** United States Naval Med. Bull., 1943, v. 41, May, p. 729.

The author describes a modified Ewing operation for the correction of cicatricial entropion of the upper or lower eyelid. A horizontal conjunctival incision is made on the everted eyelid, 3 mm. from and parallel with the lid margin. The incision goes through the entire thickness of the tarsus and the flanking portions of the tarsus must be completely divided. One needle of a doubly-armed suture is passed through the conjunctiva overlying the proximal tarsal segment midway in the incision and 1 mm. from the edge, bringing it out through the cut surface of the underlying tarsus. The needle is then passed into the cut surface of the distal tarsal segment, transfixing the entire segment plane and emerging on the skin surface above the lash margin. With the second needle a firm bite is taken through the tarsus 2 mm. lateral to and behind the original entry of the needle and brought to the skin surface 6 mm. behind the lash margin. The sutures are tightened over a rubber splint.

Together with the operations sulfonamide therapy was instituted. Good results were achieved, especially in cases with pannus and ulceration of the cornea. Two case histories are given. R. Grunfeld.

Town, A. E. **Congenital absence of lacrimal puncta in three members of a family.** Arch. of Ophth., 1943, v. 29, May, pp. 767-771.

The author reviews the literature of this rare anomaly and reports symptoms, treatment, and results in three cases. (1 photograph, references.)
Ralph W. Danielson.

15

TUMORS

Asbury, M. K., and Vail, D. **Multiple primary malignant neoplasms.** Amer. Jour. Ophth., 1943, v. 26, July, pp. 688-693. (4 illustrations, references.)

Bedell, A. J. **Bilateral metastatic carcinoma of the choroid.** Arch. of Ophth., 1943, v. 30, July, pp. 25-37.

Metastatic carcinoma of the choroid is a comparatively rare condition; only about 250 cases have been reported. The author gives an exhaustive discussion of the literature and reports a case in much detail. This case report is embellished by fundus photographs in black and white and also in color.

The characteristic fundus change is primarily the appearance of a flat, pale, pinkish-gray area with a delimiting border which is faintly pigmented and with the extension in surface rather than in thickness. The tumor is usually thin. After a time there is a detachment of the retina with or without subsequent glaucoma. In most cases the growth eventually becomes bilateral, although the tumor is usually much more advanced in one eye than in the other. The location of choice is the perimacula, but the metastasis may be in the optic nerve or ciliary body.

Clinicians must be careful not to subject the patient to an unnecessary operation. Enucleation does not stop the extension from the primary growth. The eyeball should be removed only if it is the site of uncontrollable pain. (9 illustrations including 2 color plates, extensive bibliography.)
Ralph W. Danielson.

Lloyd, R. I. **Retroillumination.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 799-801. (2 illustrations, references.)

McCrea, W. B. E. **Glioma of the retina.** Brit. Jour Ophth., 1943, v. 27, June, pp. 259-273.

A clinical and pathological study based on 12 patients suffering from glioma of the retina treated in the Royal Victoria Eye and Ear Hospital from 1938 to 1942 inclusive is presented.

Two-thirds of the patients were three years old or less when they came under observation. One patient was 67 years old (the oldest patient reported in the literature to date). In none of the cases was it possible to trace a hereditary factor. Three cases were bilateral (these were all fatal) and nine were unilateral. There was a history of trauma in two cases, five of the twelve patients are known to be dead, and six are alive and well after periods varying from four years to four months beyond excision of the eye. One case is untraced. Only one globe had definite extraocular extension. Two cases had microscopically proved invasion of the orbital tissues. One case is of extraordinary interest in

that there was recovery in spite of invasion of the optic nerve as far as the lamina cribrosa, the patient being in good health three and a half years later. All the cases with optic nerve involvement behind the lamina cribrosa died. There were eleven cases of retinoblastoma and one of neuroepithelioma (in the patient aged 67 years). (6 illustrations.)

Edna M. Reynolds.

Nano, H. M. **Fibroma of the sclerocorneal limbus.** La Semana Méd., 1943, v. 50, May 13, pp. 1062-1065.

The patient was a girl aged 11 years. The growth, lying astride the limbus with its center at the 8-o'clock position, was of a slightly rosy gray color and about the size of a small pea. The surface was smooth and glistening like that of the conjunctiva elsewhere. The tumor was hard, and was not movable on the subjacent tissues. The excised growth showed the characteristic structure of a fibroma. W. H. Crisp.

Xavier, J. de Paula. **A case of retinoblastoma.** Arquivos Brasileiros de Oft., 1942, v. 5, Dec., pp. 277-281.

Brief mention of two personal cases, one too far advanced for operation, the other subjected to enucleation and showing the orbital cavity in good condition two months later. (Gross and histologic photographs.)

W. H. Crisp.

16

INJURIES

Atkinson, W. S. **A colored reflex from the anterior capsule of the lens which occurs in mercurialism.** Amer. Jour. Ophth., 1943, v. 26, July, pp. 685-688. (4 illustrations, 2 in color, references.)

Bellows, J. G. **Local toxic effects of sulfanilamide and some of its derivatives.** Arch. of Ophth., 1943, v. 30, July, pp. 65-69. (See Section 2, Therapeutics and operations.)

Benson, C. E. **Treatment of photophthalmia following exposure to the rays of the welding arc.** United States Naval Med. Bull., 1943, v. 41, May, p. 737.

The welder is nowadays well protected from the action of the actinic rays, for he is shielded by his hood, but a bystander, even at a distance as great as 200 feet, may be affected by the rays of the welding arc or by a reflected flash. The author treated 73 cases with 2-percent butyn and 1-percent diethane hydrochloride, one drop every five minutes for four doses. A second group of 447 patients were treated with 0.25 percent nupercaine hydrochloride and 0.5 percent neosynephrine hydrochloride dissolved in zephyran 1 to 5000, one drop every five minutes for four instillations. Identical results were achieved with either method. Neither of them influenced the speed of tissue repair but the patients were subjectively greatly improved and were able to return to work much earlier than was the case with any other method of treatment.

R. Grunfeld.

Crawford, R. A. D. **A case of multiple intraocular foreign bodies.** Brit. Jour. Ophth., 1943, v. 27, May, pp. 227-229.

A number of weakly magnetic foreign bodies entered the eye, one of them lodging on the disc. After five weeks of treatment and about 28 sessions with the Haab giant magnet the two largest particles were removed. Use of the giant magnet even with a very prolonged attempt such as was

necessary in this case is considered preferable to use of a scleral incision and a hand magnet, especially where there is involvement of the optic disc.

Edna M. Reynolds.

Glover, L. P. **Bee sting of the cornea.** Amer. Jour. Ophth., 1943, v. 26, July, p. 744.

Godwin, E. D. **War gas injuries of the eye.** California and Western Med., 1942, v. 57, Nov., pp. 299-301.

Mustard gas is a clear oily fluid with an odor resembling that of mustard or garlic. It is discharged by artillery shells, trench mortars or bombs, or sprayed from aëroplanes. It is soluble in animal fat, which accounts for its rapid penetration into the skin of the eyelid. In very low concentration in the atmosphere it dulls the olfactory sense and exposure is effected without recognition. It acts upon cornea and conjunctiva as a protoplasmic poison. A latent period of from 2 to 48 hours precedes the symptoms. Reports state that 75 to 90 percent of the cases are mild and recover in about two weeks. Other cases develop more intense reaction, the cornea takes on an "orange peel" texture, the lids are edematous, and miosis due to iris spasm develops. The surface of the conjunctiva is destroyed and convalescence requires several months. Immediate adjustment of the mask as soon as the odor is detected is advised. As treatment, irrigation of the eyes with a 2-percent solution of sodium bicarbonate several times a day to decrease the bacterial flora is indicated, or a normal saline bath or a 2-percent solution of boric acid, opening the lids to let the accumulated tears escape. Another agent, used alone or with mustard gas, is lewisite, which is a vesicant similar to mustard but with the addition of arsenic. Its ocular lesions are less destructive. (References.)

Melchiore Lombardo.

Gresser, E. B. **Ocular injuries in chemical warfare.** Harofè Haivri (Hebrew Med. Jour.), 1943, v. 1, p. 52 (in English, p. 188).

As far as eye lesions are concerned the different gases act uniformly. The severity of action depends only upon the concentration and solubility of the gas. Analysis of 1,500 cases treated in the last war revealed that 75 to 80 percent were mild lesions with no corneal involvement. The subjective complaints were: sense of burning, grittiness or sand in the eye, photophobia, and spasm of the eyelids. Ten to fifteen percent showed moderate burns with chemosis of the conjunctiva. The conjunctiva presented in parts a pearly-white appearance under which the vessels were dilated. Occasional punctiform hemorrhages were seen, and varicosities and new-formed blood vessels remained after healing had taken place. The cornea presented minute, discrete, grayish spots not stained with fluorescein but consisting of edematous epithelial cells, giving the cornea a roughened (orange-skin) appearance. Five percent of the cases were severe burns with surface loss and complications. They started out with punctate lesions, which rapidly became confluent and spread to the lower half of the cornea; or as a band across the area corresponding to the palpebral fissure. Pericorneal injection and mild iritis may accompany the lesion. Deeper ulcerations may extend over the whole cornea and may cause ectasia and perforation.

Treatment consists of continuous and copious lavage with normal saline, with weak acid, or with a 2-percent sodium bicarbonate solution. Anesthesia, band-

age, oil, or ointment is not to be used. Cold compresses and watery solutions of drugs for secondary infections are recommended. R. Grunfeld.

Griffin, E. P., Gianturco, C., and Goldberg, S. **Stereoscopic method for the localization of intraorbital foreign bodies.** Radiology, 1943, v. 40, April, p. 371.

The authors use a localizer consisting of a heavy base with a vertical mast to which is attached a movable pointer that can be fixed at any level. The end of the pointer is perforated along its axis for the insertion of a metal stem carrying an artificial eye. The corneal surface of the artificial eye is placed at a distance of exactly 1 mm. from the tip of the pointer. The artificial eye is shaped from wood to the average size of a normal human eye. Thin metal wires are placed along the corneoscleral junction and along twelve meridians and along the equator. A metal stem protrudes from the center of the corneal surface along the axis of the artificial eye.

While the patient lies prone on the table, the localizer is set in such a manner that the pointer is directed along the visual axis of the injured eye and its tip is exactly 1 mm. distant from the center of the cornea. A casette is centered under the eye, and the position of the casette is carefully marked. An X-ray exposure of the orbit is made. A second casette is placed under the eye and a new exposure is made with a stereoscopic shift of 3 mm. The patient is now removed from the X-ray table and the artificial eye is placed in the tip of the localizer. A reexposure of the film is made with a low voltage, sufficient only to cast a light shadow over the previous roentgenogram of the orbit. The first casette is now carefully replaced in its former position as marked, and the film is reexposed with low voltage.

Thus is obtained a stereoscopic film of the orbit upon which is cast the shadow of the artificial eye. The latter enables one to localize the foreign body with ease. R. Grunfeld.

Neame, Humphrey. **Removal of small magnetic foreign body from the eye eighteen months after the date of injury.** Brit. Jour. Ophth., 1943, v. 27, May, pp. 226-227.

A small metallic fragment was retained in the eye for 18 months without setting up any appreciable amount of siderosis and with no symptoms except slight injection.

Edna M. Reynolds.

Ranke, O. F. **Function and protection of the eye in wartime.** Klin. Woch., 1942, v. 21, Dec. 5, pp. 1072-1075.

Protection has to be offered against dust and strong intensities of light. Statistics show that ultraviolet light is never a source of ocular damage except in high altitude. Any kind of glass, even untinted, has sufficient absorptive power against ultraviolet rays to afford proper protection, provided the spectacles fit so that lateral radiation is also eliminated.

Protection from the visible part of the spectrum has to be planned in relation to actual retinal damage, and to discomfort caused by glare. The intensity of the light causing glare may vary from 3,000 to 10,000 lux, and an absorptive power of 75 percent by the protective lens is chosen by the army.

Graphs included in this paper show the absorption of ultraviolet light by different kinds of glass, the intensity of illumination of a horizontal plane at various heights of the sun, which va-

ries from 25,000 to 100,000 lux, and the light reflection of different types of soil and street coverings.

Bertha A. Klien.

Rychener, R. O., and Ellett, E. C. **Abscess of the crystalline lens.** Amer. Jour. Ophth., 1943, v. 26, July, pp. 715-720. (7 illustrations, references.)

Staton, D. E. **Certain eye observations.** The Mississippi Doctor, 1943, v. 20, Jan., p. 348.

Four small pieces of a nonmagnetic alloy—babbitt—were found deeply embedded in the cornea and were left there. One year elapsed and the eye tolerated the alloy well.

A splinter of wood struck the only good eye of a 24-year-old man and made a quarter-inch-wide penetrating wound one eighth of an inch posterior to the limbus. Vitreous was oozing out of the wound when the author saw the patient thirty hours later. The author sutured the sclera but not the conjunctiva. The eye made a remarkable recovery, with vision of 20/30.

A nine-year-old boy was struck on the eye with a piece of concrete. It caused pain, redness, swelling, and blood in the anterior chamber which later stained the cornea badly. Three weeks later the other eye began to show signs of sympathetic ophthalmia, photophobia, tenderness, loss of vision, and slight haziness of the corneal endothelial layer. Beside atropine and sodium salicylate by mouth, five intramuscular injections of 20 c.c. of blood were given at three-day intervals. The sympathetic ophthalmia was cured completely.

A pneumococcus ulcer became worse under curettage and cauterization. It extended over the whole lower part of the cornea. Sulfathiazole 20 gr. by mouth four times a day and 2-percent numoquin hydrochloride solution four times a day were without benefit. Thereafter 10-percent sulfathiazole was applied to the wound and sulfadiazine was given by mouth, and soon a distinct improvement was noted.

In another case of pneumococcus ulcer sulfathiazole was dusted locally every two hours for four days, and every three hours for the next four days. Five days later the patient was considered well and was discharged.

R. Grunfeld.

17

SYSTEMIC DISEASES AND PARASITES

Allende, F. P. **Ocular signs in brother and sister with juvenile tabes and general paralysis.** Anales Argentinos de Oft., 1942, v. 3, April-May-June, p. 72.

A brother aged 22 and a sister aged 24 years, affected by inherited syphilis, are reported upon by Allende. They presented the picture of regular, unequal, light-rigid, and widely dilated pupils. The nerveheads and vision were normal. There were also symptoms of general paralysis. The cases are minutely described. Eugene M. Blake.

Argañaraz, Raúl. **Ocular syphilis.** La Semana Med., 1943, v. 50, April 29, pp. 911-922.

This 12-page article presents to the general physician a useful review of the incidence of ocular syphilis and descriptions of a number of the most frequent manifestations of syphilis in the eye, including those seen with the ophthalmoscope. (11 illustrations in color, tables, one graph.) W. H. Crisp.

Ayo, Corrado. **A toxic ocular reaction. 1. New property of Shwartzman**

toxins. Jour. of Immunology, 1943, v. 46, March, p. 113.

The phenomenon of local tissue-reactivity to bacterial filtrates, also called the Shwartzman phenomenon, results from combined use of local and intravenous injections of bacterial toxins. Shwartzman produced local hemorrhagic necrosis in rabbits at previously prepared skin-sites, following intravenous injection of filtrates from cultures of certain microörganisms. The bacterial products causing this reaction are mainly derived from gram-negative microörganisms. Guillery (1912) and Woods (1916) observed iridoconjunctival hyperemia in rabbits injected intravenously with filtrates of chromobacterium prodigiosum and coliform bacteria, and they suggested a possible bearing on bilateral uveitis and other human intraocular conditions. All the bacterial filtrates potent for the Shwartzman phenomenon, but none of the others, produced the ocular reaction. Numerous bacterial cultures were grown and centrifugated by the author, who describes in detail the methods and materials used in his research. Experimental observations are given on (1) ocular reaction to meningococcal toxin in rabbits, (2) regularity of occurrence of the toxic ocular reaction (T.O.R.) to meningococcal toxin, (3) bacterial species producing the T.O.R., (4) determination of potency, time of appearance, and duration of T.O.R., (6) effectiveness of various routes of injection, (7) detoxication of filtrates by formaldehyde, (8) potency of stored filtrates and their resistance to heat and pressure, and (9) purification by dialysis.

Protection against the ocular reaction was afforded by previous intracutaneous or intravenous injection of rabbits with Shwartzman's filtrates, or by injections of the venom of the moccasin snake. The reaction was reproduced in cats and dogs but failed in other usual laboratory animals. T.O.R. was obtained in 95 percent of a large number of rabbits. It represents a new property of the Shwartzman toxins and indicates their marked primary toxicity for the uveal tract of the rabbit. (22 references, 2 figures, 4 tables.)

Jerome B. Thomas.

Ayo, Corrado. **A toxic ocular reaction. 2. On the nature of the reaction.** Jour. of Immunology, 1943, v. 46, March, p. 127.

The "primary aqueous" (that obtained on a first paracentesis) does not coagulate in normal rabbits but coagulation does occur in the secondary aqueous obtained by a second paracentesis closely following the first one. Upon intravenous injection of Shwartzman filtrates the primary aqueous was found to coagulate. The writer calls this the plasmoid-toxic aqueous. Various investigations described in this paper deal with the influence of Shwartzman filtrates on ciliary-body permeability, and that of washed bacterial bodies on coagulation of the primary aqueous. The studies include permeability of the ciliary body to fluorescein staining, the role of fibrinogen in coagulation of the plasmoid-toxic aqueous, and the local protective action of adrenalin against the toxic ocular reactions. The author concludes that increased permeability of the ciliary body is a major factor in the mechanism of the toxic reactions, and that the fibrinogen system plays an essential role in coagulation of the plasmoid-toxic aqueous. A retrobulbar injection of adrenalin protects the eye against the reactions. (9 references, 2 illustrations.) Jerome B. Thomas.

Bragagnola, J. **Orbital neuralgia from unerupted canine teeth.** Anales Argentinos de Oft., 1942, v. 3, April-May-June, p. 63.

A case of severe orbital neuralgia, occurring in a 39-year-old man, did not respond to ocular therapy. Radiographic study showed an unerupted canine on the same side as the neuralgia. Extraction of the tooth brought complete relief. The author discusses the frequency, etiology, and symptomatology of the condition. Pain is caused by irritation or compression of a branch of the trigeminal.

Eugene M. Blake.

Dessoff, Joseph. **The eye and related functional disturbances.** Med. Annals Dist. of Columbia, 1943, v. 12, March, pp. 97-101.

The writer discusses some of the psychosomatic disturbances as they affect the eye. Because the sense of sight is usually the most highly regarded of all the senses it is natural that it should be the one most often disturbed by psychic influences. Presbyopes constitute a large group in which functional disturbances are common. The writer believes that neglected presbyopia is often the cause of hypochondriasis and of mild forms of melancholia. This may be due to fear of ensuing blindness or to concern over this indication of increasing age. The visual symptoms of hysteria are numerous and are often difficult to diagnose. The characteristic feature is pronounced inconsistency and variability of the visual fields. By varying the distance at which the field is taken one can bring out many discrepancies. In addition to impairment of vision hysteria may manifest itself by ptosis, spasm of lids, anesthesia of cornea and conjunctiva, nystagmus, conjugate deviation and convergent squint, photophobia, and headaches. The ophthalmologist too often ignores the importance of eye dominance and handedness in the child's ability to learn to read. Homolateral control of eye and hand is the common rule, and contralateral control tends to create muscular and visual confusion. Some confusion in learning is suffered by many persons who are left-eyed and left-handed, but their difficulties are tremendously increased if the original left-handed status becomes converted to right-handedness by training. Word-blindness, reversal of figures, and stammering, followed by the development of behavior disorders, may occur. The earlier the pathologic phase is recognized the better for adequate treatment. The author is convinced that the relationship between blindness and insanity is much more common than is generally supposed. He briefly reviews three cases treated at St. Elizabeth's Hospital which demonstrate not only that insanity can be traced to loss of sight but that the relief of blindness by operation can restore the mental condition to normal. (2 references.)

Jerome B. Thomas.

Gómez-Márquez. **Pathology in Honduras, and its relations with the prevention of blindness in that country.** Ophth. Ibero Amer., 1942, v. 4, no. 3, pp. 260-270 (in English, p. 271).

This paper, addressed to a general medical organization, discusses in broad terms the influence of various systemic disturbances in the production of ocular disorders.

Harley, R. D. **Ocular myiasis (ophthalmomyiasis).** Amer. Jour. Ophth., 1943, v. 26, July, pp. 742-743.

Meillon, B. de, and Gillespie, J. C. **Note on a human eye worm.** South African Med. Jour., 1943, v. 17, Jan. 9, pp. 5-6.

A report of a case of infestation of the human eye by a nematode, probably the first case reported in South Africa. The infestation was probably acquired in Central Africa, where the patient had resided for several years. The worm was removed from the subconjunctival tissues just above the lower fornix of the eye. It was 115 mm. long and 0.5 mm. wide. The essential factor in removal is the preparation of instruments beforehand and quickness in grasping the worm and covering tissues, and passing a suture around them. The prognosis in these cases is good, as microfilaria do not occur in human beings, and the complications resulting from them do not occur. (2 figures.) Jerome B. Thomas.

Ormsby, O. S. **Dermatologic lesions about the eyes.** Amer. Jour. Ophth., 1943, v. 26, Aug., pp. 850-855. (References.)

Vázquez-Barrière, A. **The eye in Nicolas-Favre disease.** Arch. de Oft. de Buenos Aires, 1941, v. 16, Dec., p. 653.

The author describes the ocular findings in a series of 366 cases of lymphogranuloma or Nicolas-Favre disease. From the biomicroscopic standpoint there is a marked increase in the visibility of the corneal nerves, particularly in the pupillary area, as found by the author in 28 percent of the patients. The intraocular tension was found below normal in 79.5 percent, and not infrequently this subnormal tension was below 10 mm. Hg. There was no relation between the tonometric figures and the degree of visibility of the corneal nerves. Ophthalmoscopically, engorgement and tortuosity of the retinal veins and congestion with blurring of the margins of the papilla were observed in 28.4 percent of the cases. A slight papilledema was observed at times, and a true choked disc was found in two cases, but none of the patients showed other signs of increased intracranial pressure. Tonoscopic determinations yielded rather high figures for the retinal arterial pressure, as determined with Bailliart's ophthalmodynamometer, but correct interpretation of these readings was difficult in the presence of the markedly decreased intraocular pressure found in this disease. The author concludes that lymphogranulomatosis is a systemic infection produced by a specific virus, that ocular involvement is the rule, and that the portal of entry may be in the conjunctiva. In the latter case the condition would give rise to an oculoglandular syndrome. Plinio Montalván.

18

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Bahn, C. A. **Ophthalmic requirements of the military services.** Arch. of Ophth., 1943, v. 29, May, pp. 831-843.

This is a revision of the author's previous paper (Amer. Jour. Ophth., 1942, v. 25, p. 1404). The complete table of material for each of the services is arranged as follows: (1) functional requirements; (2) qualifying and disqualifying conditions and diseases; (3) references for changes in ophthalmic requirements which have been issued since June, 1942.

Ralph W. Danielson.

McClung, G. W. **Problems in teaching dramatics to the blind.** Outlook for the Blind, 1943, v. 37, April, p. 95.

The importance of dramatics as part

of the teaching of the blind is discussed by the author, who heads the Department of English in the New York Institute for the Education of the Blind: Acting represents a transition from their normal activity to a land of fantasy, and allows the students to realize some of their abstract dreams. The author quotes Betty McGuire as saying, in The Teachers' Forum for November, 1936, that judging from her own experience and observation, the need of such self-expression is especially imperative among blind children, with their repressed emotions.

The obvious difficulties in producing plays with blind actors include the timing of action. Devices such as narrow strips of carpeting to guide the actors, and rubber mats indicating places where they are to remain stationary, are suggested. Stage furniture must of course be placed exactly.

More subtle difficulties are those of speech and pantomime. McClung uses the phrase "speaking in Braille" to characterize the monotone characteristic of the reader of Braille, who cannot see ahead how the sentence is coming out, and who cannot picture the commas and the question and exclamation marks until he comes to them, too late for guidance as to expression. Reading poetry with the instructor, the author has found, helps the student to acquire the feeling of rhythm, otherwise neglected in the concentration required for interpreting Braille.

Pantomime is most difficult detail, since from infancy the blind have not observed the language of gesture nor unconsciously absorbed facial expression. McClung has found that it usually takes the blind student three or four times as long as a seeing student to coördinate lines with action.

Suggestion and analogy he considers more important than imitation, since the blind student can thereby achieve a naturalness of expression, but the student can also feel the lips in a smile, and learn something of what the normal actor learns through the mirror.

Dorothy Nichols.

Nair, M. A. **Diseases of the visual apparatus, ancient and modern.** Jour. Indian Med. Assoc., 1942, v. 11, March, p. 175.

The author analyzes the descriptions of 27 diseases found in ancient Hindu literature, and compares these descriptions with modern conceptions. He is handicapped by lack of, and uncertain definitions of, ancient terminology.

R. Grunfeld.

Prado, Durval. **Advice to opticians.** Arquivos Brasileiros de Oft., 1942, v. 5, Dec., pp. 304-306.

Brazil is said to lack an official school with a special course for the training of opticians. A number of practical considerations, as to the handling of patients and as to the filling of prescriptions, are discussed by the author.

W. H. Crisp.

Sena, J. A. **Trachoma among the school children of Mendoza.** Arch. de Oft. de Buenos Aires, 1941, v. 16, Dec., p. 674.

The article contains tables and statistical data concerning the incidence of trachoma among the school children of the province of Mendoza, Argentina. The information was compiled by the Section of Trachoma of the Department of Public Health.

Plinio Montalván.

Victoria, V. A. **An attempt at classification of the clinical types of Argen-**

tine trachoma. Arch. de Oft. de Buenos Aires, 1941, v. 16, Dec., p. 680.

The author discusses MacCallan's and Fuchs's classifications of trachoma and finds them unsuitable for cataloguing the clinical forms of trachoma prevalent in Argentina, since these vary somewhat from those observed in the Middle and Far East. The writer proposes a classification as follows: 1, attenuated type, 2, nodular type, 3, infiltrative type, 4, cicatricial type.

Plinio Montalván.

19

ANATOMY, EMBRYOLOGY, AND COMPARATIVE OPHTHALMOLOGY

Di Dio, J. A. D. **Observations on Whitnall's orbital tubercle in the zygomatic bone of man (with investigations in vivo).** Arquivos Brasileiros de Oft., 1943, v. 6, Feb., pp. 1-8.

This tiny bony prominence, about the center of the outer rim of the orbit, was present in 254 out of 285 craniums studied by the author, it being present bilaterally in 222 and unilaterally in 32. The author suggests that this anatomic detail should be recorded in treatises and atlases of anatomy. (3 illustrations.) W. H. Crisp.

Fortin, E. P. **Significance of the insertion of the oblique muscles over the macula.** Arch. de Oft. de Buenos Aires, 1942, v. 17, Jan., p. 10.

According to the author, the scleral fibers have a very orderly arrangement and do not possess the irregular distribution described in the classic textbooks. Muscle fibers are found among them, in the thickness of the sclera, over the area corresponding to the insertion of the two oblique muscles. These muscle fibers penetrate deeply toward the macula, upon which they exert definite traction. (Photomicrographs.) Plinio Montalván.

Murray, P. D. F. **The development of the conjunctival papillae and of the scleral bones in the embryo chick.** Jour. of Anatomy, 1943, v. 77, April, pp. 225-240.

The development of the conjunctival papillae and of the scleral bones in the chick embryo is described in detail. The description is not suitable for abstracting.

Novah, Gerson. **Contribution to the study of the anatomy of the ciliary ganglion and its connections in man.** Arquivos Brasileiros de Oft., 1943, v. 6, Feb., pp. 9-12.

The author summarizes certain conclusions from his investigations on the anatomy of the ciliary ganglion and its connections in man, as set forth more extensively in his doctorate thesis (1941) before the Faculty of Medicine of the University of São Paulo, Brazil. The conclusions are in part as follows: The ciliary ganglion, seen from the side, appeared rectangular in 43 percent of the cases, and had a definitely irregular form in 32 percent. In 62 percent the lower margin of the ganglion was lower than a horizontal plane corresponding to the lower surface of the optic nerve, while in 38 percent it coincided with or was higher than this plane. The distance from the inferolateral orbital angle to the middle of the lateral face of the ganglion varied between 34 and 51 mm., and the line which represents the anterior prolongation of this distance, when projected on two imaginary lines, the first of which passes through the angles of the palpebral fissure and the second of which divides the base of the orbit into

halves (right and left), forms angles which vary respectively between 60 and 89 degrees and 58 and 85 degrees. In 9 out of 47 cases the so-called long root originated exclusively in the interior of the orbit, while in 11 out of 47 cases this root, having more than one radicle, originated partially within and partially outside the cavity. The short ciliary nerves may occasionally emerge from the lateral face of the ganglion, beyond the usual zone of emergence. No two cases, even in the same ethnic group or in the same individual, show the same morphology of the ciliary ganglion and its branches. (2 illustrations.) W. H. Crisp.

Smeltzer, G. K. **Changes induced in the Harderian gland of the guinea pig by the injection of hypophyseal extracts.** Anat. Record, 1943, v. 86, May, pp. 41-55.

The Harderian gland, which is a large compound, apocrine gland, secreting a fatty substance, is found in the orbits of almost all mammals except the anthropoids. Injection of extracts of the anterior pituitary causes marked hypertrophy of the gland, with increase in the amount of the lipid secretion which is mainly neutral fat. In thyroidectomized animals, the response to the pituitary extract is, if anything, slightly increased. T. E. Sanders.

NEWS ITEMS

Edited by Dr. Donald J. Lyle
904 Carew Tower, Cincinnati

News items should reach the editor by the twelfth of the month

Deaths

Dr. Walter H. Rea, Topeka, Kansas, died May 26, 1943, aged 64 years.

Dr. Leslie C. Tilden, Oberlin, Kansas, died May 17, 1943, aged 76 years.

Dr. Grover H. Poos, Palm Springs, California, died May 29, 1943, aged 58 years.

Dr. Raymond W. Andrae, Plainfield, Wisconsin, died June 12, 1943, aged 61 years.

Dr. Julian C. Chandler, Tampa, Florida, died May 20, 1943, aged 65 years.

Dr. Charles A. Dillon, Tulsa, Oklahoma, died May 29, 1943, aged 64 years.

Dr. Alonzo A. Browning, Phoenix, Arizona, died June 24, 1943, aged 58 years.

Dr. Clifton P. Bullard, Miami, Florida, died May 25, 1943, aged 56 years.

Dr. Hudson W. Fleischhauer, Port Angeles, Washington, died June 29, 1943, aged 47 years.

Miscellaneous

In honor of her father, the late Dr. John O. McReynolds, Mrs. F. W. Wozencraft, Washington, D.C., has presented a fund for the purpose of establishing a lectureship in ophthalmology at the University of Texas Medical Branch, Galveston.

The eighteenth annual spring Graduate Course on Otolaryngology and Ophthalmology will be given at the Gill Memorial Hospital on Monday, April 4, 1944, and continue a full week.

The courses are available to physicians specializing exclusively with the eye, ear, nose, and throat as set forth in the directory of the American Medical Association.

Societies

The annual Congress of the Ophthalmological Society of Egypt took place at the Memorial Ophthalmic Laboratory, Giza, Egypt, on March 19th and 20th, according to a communication just received. The symposium for the congress was "Myopia."

The American-Soviet Medical Society, recently organized to stimulate the exchange of medical information between the United States and the Soviet Union, formally launched its Detroit chapter on Wednesday, August 18th. Dr. Walter B. Cannon, president of the society, has done much to encourage this exchange. The national headquarters of the society are at 130 West 46 Street, New York City. The American Review of Soviet Medicine, its publication, maintains editorial offices at 1900 East Monument Street in Baltimore.

Personals

Dr. Everett L. Goar has been recently appointed professor and chairman of the department of ophthalmology at Baylor University College of Medicine, Houston, Texas.

At the seventy-eighth annual meeting of the Michigan State Medical Society, Dr. Peter C. Kronfeld of Chicago spoke on "Preventable blindness."

Drs. Richard Townley Paton and David Henry Webster were appointed clinical professors, department of ophthalmology, New York University College of Medicine. Drs. Frank C. Keil, Walter Guernsey Frey, Jr., and Ervin A. Tusak have been promoted to clinical professors of ophthalmology.

Dr. I. Franklin announces the removal of his offices to 901 Straus Building, Milwaukee.

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